

**Medical School Learning Environment and Quality of Life among Lesbian, Gay, and
Bisexual Second-year Medical Students of Color**

by

Janke B. Mains-Mason

BS, University of Florida, 2017

Submitted to the Graduate Faculty of the
Department of Behavioral and Community Health Sciences
Graduate School of Public Health in partial fulfillment
of the requirements for the degree of
Master of Public Health

University of Pittsburgh

2020

UNIVERSITY OF PITTSBURGH
GRADUATE SCHOOL OF PUBLIC HEALTH

This essay was presented

by

Janke B. Mains-Mason

It was approved on

June 19, 2020

by

Kristen Eckstrand, MD, PhD, Psychiatry Fellow, Department of Psychiatry, School of Medicine,
University of Pittsburgh

Essay Advisor: Andre Brown, PhD, MPH, Assistant Professor, Department of Behavioral and
Community Health Sciences, Graduate School of Public Health, University of Pittsburgh

Copyright © by Janke B. Mains-Mason

2020

Medical School Learning Environment and Quality of Life among Lesbian, Gay, and Bisexual Second-year Medical Students of Color

Janke B. Mains-Mason, MPH

University of Pittsburgh, 2020

Abstract

Background: Literature rarely explores learning environment and well-being outcomes specific to LGB medical students, medical students of color, and LGB medical students of color.

Methods: We conducted a secondary analysis of demographic, student-faculty interaction, student-student interaction, learning environment emotional climate, and quality of life by sexual orientation and racial identity using data from the Association of American Medical Colleges' Year 2 Questionnaire. We ran Multivariate Analysis of Variance models for learning environment outcomes and Univariate Analysis of Variance models for quality of life. We ran all models at 95% confidence and included sex, age, school region, and in-person attendance as covariates. We investigated association between perceptions of learning environment and quality of life using Multivariable Linear Regression.

Results: Eight percent ($n=2767$) of 34,679 second-year medical students were LGB, 41.3% ($n=1144$) of whom were students of color. LGB students had lower perceptions of student-faculty (CI: -0.49, -0.23; $p<0.001$) and student-student (CI: -0.49, -0.23; $p=0.002$) interactions than their heterosexual peers. These effects were exacerbated among Asian, Black, and Underrepresented Multiracial LGB students having poorer student-faculty interactions (all $p<0.01$) compared with white LGB peers, and Asian, Black, Indigenous, and Underrepresented Multiracial LGB students having poorer student-student interactions compared with white LGB peers (all $p<0.05$). LGB medical students had worse perceptions of learning environment emotional climate (CI: -0.72, -0.48; $p<0.001$) and reported lower well-being (CI: -2.52, -1.74; $p<0.001$) compared to heterosexual

students. There were no significant differences in emotional climate and well-being by racial groups among LGB people.

Perceptions of learning environment were significantly associated with quality of life score, with few moderations by sexual orientation and racial identities.

Conclusions: Further research is required to understand the etiology of poorer outcomes among students with minoritized social identities, with a focus on the intersections of racism and heterosexism. Further research should act to ameliorate these inequities.

Significance: The public health significance of this thesis is to add to quality of life literature by: (a) including data from a national dataset; (b) investigating presence of well-being, not just absence of mental illness; (c) identifying structural learning environment outcomes that could impact quality of life; and (d) situating results specifically among LGB people of color. We hope our long-term public health impact will be to provide a path towards improving the health and well-being of LGB medical students of color.

Table of Contents

Preface	xi
1.0 Introduction.....	1
1.1 Medical Student Well-being.....	2
1.2 Medical Student Well-being and the Learning Environment.....	4
1.3 The Current Study	5
2.0 Literature Review.....	7
2.1 The Medical School Learning Environment for Lesbian, Gay, and Bisexual Medical Students and Medical Students of Color	7
2.1.1 Overall Learning Environment	7
2.1.1.1 LGB Medical Students	7
2.1.1.2 Medical Students of Color.....	9
2.1.2 Student-Faculty Interactions	9
2.1.2.1 LGB Student-Faculty Interactions	9
2.1.2.2 Student-Faculty Interactions among Students of Color	11
2.1.3 Student-Student Interactions.....	13
2.1.3.1 LGB Student-Student Interactions.....	13
2.1.3.2 Student-Student Interactions among Students of Color	14
2.1.4 Emotional Climate and Well-being.....	14
2.1.4.1 Emotional Climate and Well-being among LGB Students	14
2.1.4.2 Emotional Climate and Well-being among Students of Color.....	15
2.2 The Silencing of Lesbian, Gay, and Bisexual Medical Students of Color	16

3.0 Methods	18
3.1 Study Populations.....	19
3.2 Measures	20
3.2.1 Race and Sexual Orientation	20
3.2.2 Perceptions of Learning Environment	22
3.2.3 Quality of Life.....	24
3.3 Statistical Analysis.....	24
4.0 Findings	27
4.1 Demographics	27
4.2 Perceptions of Learning Environment	28
4.2.1 Student-Faculty Interaction.....	28
4.2.2 Student-Student Interaction	30
4.2.3 Emotional Climate.....	32
4.3 Quality of Life	34
4.4 Regression and Moderation	35
5.0 Discussion	38
5.1 Student-Faculty Interaction and Student-Student Interaction	38
5.2 Emotional Climate and Quality of Life	40
5.3 Regression and Moderation	42
5.4 Limitations.....	44
5.5 Implications	46
6.0 Conclusions.....	50
Appendix A Study Outcomes Model Statistics.....	52

Appendix B Improvable Responses by Study Outcome	53
Appendix B.1 Student Faculty Interaction	53
Appendix B.2 Student-Student Interaction.....	54
Appendix B.3 Emotional Climate	55
Appendix B.4 Quality of Life.....	56
Bibliography	57

List of Tables

Table 1: Building Racial Groups by Representation and Ethnic Category	20
Table 2: Perception of Learning Environment Scales and Component Questions.....	23
Table 3: Second Year Medical Student Demographics 2016-2018.....	27
Table 4: Student-Faculty Interaction by Sexual Orientation and Race.....	29
Table 5: Student-Faculty Interaction by Race within Sexual Orientation.....	30
Table 6: Student-Student Interaction by Sexual Orientation and Race	31
Table 7: Student-Student Interaction by Race within Sexual Orientation	32
Table 8: Emotional Climate by Sexual Orientation and Race.....	32
Table 9: Emotional Climate by Race within Sexual Orientation	33
Table 10: Quality of Life by Sexual Orientation and Race.....	34
Table 11: Quality of Life by Race within Sexual Orientation	35
Table 12: Stepwise Regression Results for Learning Environment and Quality of Life	36
Table 13: Study outcome model statistics	52

List of Figures

Figure 1: Percentage of students with improvable responses to questions for the Student-Faculty Interaction subscale	53
Figure 2: Percentage of students with improvable responses to questions for the Student-Student Interaction subscale	54
Figure 3: Percentage of students with improvable responses to questions for the Emotional Climate subscale	55
Figure 4: Percentage of students with improvable responses to questions for the Quality of Life Scale	56

Preface

Many acknowledgements to make because I have much for which and many for whom to be grateful.

First, the University of Pittsburgh and myself are settled on the stolen land of the Adena, Hopewell, and Monongahela tribes (<https://www.wesa.fm/post/who-lived-here-first-look-pittsburgh-s-native-american-history>). In acknowledgement of the land, I offer the following learning and action resources:

- Tuck, E., & Yang, K. W. (2012). Decolonization is not a metaphor.
Decolonization: Indigeneity, education & society,
1(1). <https://www.ryerson.ca/content/dam/aec/pdfs/Decolonization-is-not-a-metaphor.pdf>
- Individuals to donate
 - <https://twitter.com/tuckwoodstock/status/1183779234134683648?s=20>
 - <https://twitter.com/iconickbeauty/status/1192146308280258565?s=20>
 - In general, search “Indigenous venmo” or “Indigenous cashapp” on Twitter.
- National: <https://www.diversitybestpractices.com/news-articles/top-native-american-organizations-to-know>

Second, a thanks to my teachers through this program who taught me many things, including to speak out against injustice and to remember my power even when in a disempowered position – particular thanks to Dr. Tiffany Gary-Webb and Dr. Gina Garcia for the latter lesson. Thank you to Paul Markgraf, without whose administrative support, nobody, let alone myself,

would be functioning. Thank you to the Association of American Medical Colleges for collecting and sharing these data with me.

Thirdly, thank you to my peers who emotionally supported me through this graduate school program. Kyla Christensen, Laurenia Mangum, Tiger Litam, Kirsten Crowhurst, Shannon Mitchell, Audrey Wrobel, Emily Svitek, Neena Schueller, Alan Toroella, Jael Roitberg-Kleiman, Stephanie Miller, Daniel Barrera – without you all, this would have been much harder. And much less fun!!!

To Dr. Andre Brown: Dr. Brown, words cannot adequately capture my gratitude. From the first moment you agreed to serve as Chair, you brought a sense of stability and security through this process. There were times I worried when we met that it would be miserable and I would have so many corrections and I would feel stressed about conflict – but these were consistently non-issues because of your incredible emotional communication, your clear delivery of feedback, and your unparalleled ability to take this essay from pretty good to INCREDIBLE. I have appreciated your wisdom and your peace and your straightforwardness through this process, especially so after the isolation period of the COVID-19 pandemic. Thank you, immensely. Thank you, from the deepest parts of my heart.

To Dr. Kristen Eckstrand: Dr. Eckstrand, without you I quite literally would not be here. You were the first person to talk to me about the Year 2 Questionnaire, and the first person to talk to me about medical education and medical education research, which you continue to do. Your continued investment in my professional development, my development as a researcher, and my personal development mean so much to me. I am grateful for our hour data meetings, which more often turned to hour-and-a-half data meetings to accommodate a half hour of chatting. Working

with you is a joy, and I look forward to continuing. Thank you for all of your guidance on this project.

To me: Janke Bjorn Mains-Mason you beautiful, perfect, incredible woman. WOMAN. You are a W O M A N. A PROFESSIONAL woman. A woman with her MPH. I am so, so, so proud of you. It was literally such torture to get here. TORTURE. But we learned so so so much and I am so grateful – SO grateful – to you for doing the work that it took to learn all of that stuff. So much of my graduate school learning was centered around social justice, and racism, and whiteness, and emotional processing, and emotional conflict – and that stuff is so hard to learn, and triggers all SORTS of wild stuff, and you learned SO. MUCH. I am SO proud of you. I am SO grateful for you. I love you so, so deeply. Thank you.

To the reader: Thank you for coming. Thank you for reading this. Thank you for being interested in a topic adjacent enough to this essay that it arose in your literature search. May this essay find you well. Should you have any questions for me, please do not hesitate to reach out. I appreciate your readership.

1.0 Introduction

Medical students face challenges to their well-being in medical school including depression, anxiety, and burnout.^{1–3} These challenges may be greater when compounded with a minoritized social identity. Lesbian, Gay, and Bisexual (LGB) medical students report greater depression and anxiety than their heterosexual peers.⁴ African American medical students face higher rates of depression and anxiety than their white peers.⁵ A multitude of studies demonstrate the impact of medical school learning environment (i.e. “current perceptions, attitudes, and expectation that define the institution and its members”⁶) on the well-being of medical students.^{7–10} However, there is limited literature describing medical student learning environment and well-being using nationally representative datasets, especially in the LGB- and medical student of Color-focused literature.^{5,11–13} The absence of nationally representative datasets limits the generalizability of existing literature. Further, few studies investigate the direct relationship between learning environment and well-being,^{9,12} leaving unidentified modifiable structural intervention points, such as creating programs and adjusting class and grading structure,¹⁰ or deeper transformations of interpersonal interactions between students, their peers, and faculty, and the ways that medical schools promote achievement among students. Lastly, literature rarely explores medical school learning environment and well-being outcomes among students who are both LGB and of color.¹¹ Without exploring intersecting systems of racism and heterosexism in medical schools that may exacerbate adverse learning and well-being outcomes,¹⁴ these systems and their compounding effects remain unchallenged. This study helps to fill these gaps in the literature. Using a nationally representative sample of second-year medical students, we investigate differences in perceptions of medical school learning environment and quality of life

by race and sexual orientation. We also investigate the direct relationship between medical school learning environment and medical student quality of life. By further explicating the relationship between perceptions of learning environment and medical student quality of life, this study will identify modifiable structural factors to target in medical school learning environment interventions to improve well-being among students with minoritized identities.

1.1 Medical Student Well-being

Well-being is a multifaceted construct that includes “the presence of positive emotions and moods (e.g., contentment, happiness), the absence of negative emotions (e.g., depression, anxiety), satisfaction with life, fulfillment and positive functioning.”¹⁵ The preamble of the Constitution of the World Health Organization asserts, “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.”¹⁶ As such, efforts to improve health for medical students must also focus on the physical, mental, and social well-being of these students. Fostering medical student well-being is also important to their academic success and positive patient care.¹

Depression is a prominent challenge to the well-being of medical students. In a meta-analysis of 77 studies representing 62,728 medical students, the prevalence of depression among medical students was 27%.¹ This prevalence is much greater than that of the general US population.¹⁷ Only 12.9% of students with depression sought treatment.¹ Another study with 169 St. Louis University medical students identified additional challenges to medical student well-being, including maladaptive perfectionism, imposter phenomenon, shame and/or embarrassment,

and comparison to others.³ Medical students were more likely to report depression and lower sense of self-worth when these factors were present.³

Depression and other mental health challenges are more pronounced in LGB medical students compared to their heterosexual peers. Students with minoritized sexual orientation often exhibit significantly greater depressive and anxiety symptoms than heterosexual medical students.⁴ In a study of 4,673 first-year medical students across 49 United States medical schools, the prevalences of depression, anxiety, and low self-rated health among 232 students with minoritized sexual orientation were 20.7%, 10.8%, and 10.1% respectively.⁴ The prevalence of these symptoms were significantly higher compared to heterosexual students in the study.⁴ Medical students with minoritized sexual orientation also reported more social stressors, including being called names or insulted at least a few times a year; being harassed or threatened at least a few times a year; and feeling a lack of companionship, left out, and isolated at their medical school.⁴ Additionally, in another study, two times as many LGB medical student survey respondents reported depression compared to their heterosexual counterparts.¹² These studies indicate that LGB medical students have increased symptoms of mental illness and greater challenges to their mental well-being compared to their privileged heterosexual peers.

Similarly, racially minoritized medical students have worse mental health compared to their white peers. In a study of 4,732 first-year medical students at 49 United States medical schools, African American medical students exhibited significantly greater depressive and anxiety symptoms than their white counterparts.⁵ African American medical students had 59% greater risk of being classified as having symptoms of depression and 66% greater risk for symptoms of anxiety.⁵ Further, African American medical students had an 83% greater risk of lacking social support and 84% greater risk of reporting lower control over their life compared to white medical

students.⁵ In a follow up study, Hardeman et al¹⁸ found that African American medical students who reported a high salience of their racial identity had higher depression, anxiety, and perceived stress. As with LGB students, this literature indicates that racially minoritized students face greater symptoms of mental illness and challenges to their well-being compared to their peers with privilege, i.e. white medical students.

1.2 Medical Student Well-being and the Learning Environment

Mental well-being among medical students is influenced by several factors, including the medical school learning environment.^{2,8,9} In a scoping review by Mihailescu & Neiterman,² the authors cite the competitive culture and prioritization of others (e.g. patients, others to whom medical students have responsibility) in the medical school learning environment as negative influences on the mental health of medical students. Medical school admissions value qualities such as rigidity, perfectionism, and excessive devotion to work. Rewarding these qualities in the admissions process may facilitate the enrollment of a greater number of students who may be more vulnerable to mental illness than those students without these qualities.²

The mental well-being of medical students is also affected by their interactions with teachers, the atmosphere, and curricular and extracurricular activity. In a study of 1,350 medical students across 22 Brazilian medical schools, better student perceptions of learning, teachers, the atmosphere, and better academic and social self-perceptions were all associated with improved quality of life and medical school-related quality of life.⁸ This was especially true for the psychological health domain of quality of life.⁸ Likewise, as perceptions of learning environment worsened, well-being scores also decreased.⁸ A study of 146 medical students at Virginia

Commonwealth University paralleled these findings: students scoring higher on well-being reported better perceptions of learning environment, while students reporting more stress had worse perceptions of learning environment.⁹ Multivariate regressions further showed learning environment affected well-being but not stress.⁹ These studies indicate that the learning environment is a viable structural intervention point that can impact medical student well-being.

1.3 The Current Study

LGB medical students and medical students of Color exist with unique challenges to well-being compared to their privileged heterosexual and white peers. It is impossible to understand the unique challenges that face these communities when LGB medical students and medical students of Color are not centered in the conduct of research nor reporting of research findings. Among the above studies, only one study investigated the relationship between learning environment and well-being among LGB medical students.⁹ Only one study investigated the relationship between learning environment and well-being among medical students of Color.¹² Further, studies with LGB medical students or students of Color samples tended to only operationalize well-being as the absence of adverse mental health outcomes. These definitions did not include other constructs of well-being such as social support and control over life.¹² Therefore, the results from these studies are limited in their ability comprehensively guide the development of interventions to improve the medical school learning environment and well-being for medical students with minoritized racial and sexual identities. Finally, without findings that acknowledge the shared responsibility of both medical students and the medical school to create positive medical student

well-being, interventions will be inherently limited in ameliorating facets of medical school learning environment that create negative well-being among students.

Each of these realities is especially true for LGB medical students of Color. Despite the expectation that intersecting systems of oppression would exacerbate negative learning environment and well-being outcomes, literature is nearly nonexistent in describing these students' experiences during medical school. Without this literature, it is impossible to understand unique challenges to well-being facing LGB medical students of color and impossible to create interventions that target modifiable structural outcomes specific to their needs.

Using a nationally representative dataset, this study will address each of these gaps in the literature. We will explore experiences of learning environment and quality of life by race and sexual orientation among second-year medical students. Our exploration will account for students with multiply minoritized identities. Additionally, this study will examine the association between perceptions of learning environment and quality of life, and the effects that race and sexual orientation have on this relationship. Finally, this study will identify areas of future research and intervention that targets modifiable structures of the medical school learning environment and center the well-being of Lesbian, Gay, and Bisexual medical students of Color. By further explicating the relationship between perceptions of learning environment and medical student quality of life, this study provides a path towards developing interventions in the medical school learning environment that facilitate equitable learning experiences and well-being outcomes for LGB and student of color medical students.

2.0 Literature Review

2.1 The Medical School Learning Environment for Lesbian, Gay, and Bisexual Medical Students and Medical Students of Color

2.1.1 Overall Learning Environment

2.1.1.1 LGB Medical Students

People – students, faculty, administrators – at medical schools may verbally value diversity, but often do not translate these verbal commitments to tangible outcomes.^{12,19–22} The Liaison Committee on Medical Education (LCME) requires commitments to diversity and diversity recruitment and retention programs for school accreditation.²³ At one US medical school, 58.4% of medical students felt sexual orientation equality was extremely important.²⁴ At another school, 90% of medical, nursing, and physician assistant student respondents valued faculty and student diversity.¹⁹ However, 64% of these students did not see their medical school as diverse, 9% of thought the school was homophobic, 6% racist, and 7% sexist, and more medical, nursing, and physician assistant students with minoritized sexual orientations reported a homophobic campus.¹⁹ Other studies show perceptions of negative learning environment ranging from 13.7% of Transgender, Lesbian, Gay, and Bisexual (TLGB) healthcare trainees seeing a negative or very negative overall climate for TLGB people,²² to, in the largest of the reviewed studies, 66.1% of all medical students perceiving a non-inclusive medical school campus climate.¹²

Discrimination in the learning environment is not a novel or unique experience for Lesbian, Gay, and Bisexual (LGB) students. From 1999 to 2011, experienced or witnessed discriminatory

events due to binary gender bias decreased at one medical school, but people at the medical school continued discriminating on the basis of sexual orientation.²⁴ At another school in the United Kingdom, non-heterosexual medical students were more likely to experience joking at their expense, such as use of humor based around belittlement.²⁰ Parallel findings from a Canadian medical school showed TLGB medical students endured negative comments and/or jokes, rumors, or bullying and/or harassment.²¹ They were more likely to witness or be exposed to heterosexism and anti-TLGB discrimination, felt that trans medical students were treated less fairly than other medical students, and disagreed that medical students spoke positively of TLGB people.²¹ One study showed 24.6% of TLGB healthcare trainees from across the United States experienced workplace conduct in past year due to their sexual orientation that interfered with their ability to work or learn.²² Research on implicit and explicit bias across 49 medical schools showed that medical students generally had less implicit and explicit biases towards lesbian and gay people by the end of their four years of medical school.²⁵ However, when one looks at these findings closer, the change in medical students' implicit bias, though statistically significant, only declined slightly.²⁵ Further, at some schools, medical students had the same or more implicit and explicit biases in year four versus year one.²⁵

Medical students and healthcare trainees attribute negative learning environment for LGB folks to institutional homophobia and heterosexism, fear of institutional religiosity or conservative political views, fear of identity disclosure, joking from faculty and peers, lack of venues for support, and lack of TLGB inclusion in diversity initiatives as barriers to feeling included.^{11,22} Medical students' qualitative descriptions of reporting discrimination and harassment have described the process as inaccessible, burdensome, unlikely to change the situation, and potentially incurring personal consequences.²⁰

2.1.1.2 Medical Students of Color

A narrative review of studies conducted with underrepresented minoritized students between 1980 and 2012, i.e. Black, Hispanic, and Indigenous students, found that these students experienced less positive learning environments, more frequently observed or experienced racial discrimination and harassment personally, and were more likely to feel race had a negative impact on their medical school experiences compared to non-underrepresented minoritized students.¹³ Underrepresented minoritized students reported negative racial experiences regardless of the year data were collected.¹³ In three studies perceptions of learning environment were discussed, two of which noted worse learning environment among underrepresented minoritized students compared to their white peers, while the third showed no difference.¹³ In five studies, underrepresented minoritized students felt their race had a negative impact on their medical school experiences.¹³ In one study, 46.7% of the underrepresented minoritized students perceived that racism existed at their institution compared to 21% of their well-represented peers.¹³ In another study of fourth year students, 76% underrepresented minoritized students felt race affected their educational experience compared to 30% of their white peers.¹³

Unfavorable academic climate was likewise noted in multiple accounts among Indigenous students.^{26,27} In these accounts, Indigenous people noted avoiding the climate altogether or having to learn to navigate that climate in order to succeed.^{26,27}

2.1.2 Student-Faculty Interactions

2.1.2.1 LGB Student-Faculty Interactions

LGB students report an array of discriminatory faculty interactions. In one study of 261 medical, nursing, and physician assistant students, 12% of students witnessed faculty disparaging

remarks and offensive, hostile, or intimidating behaviors towards racially minoritized people and people of low socioeconomic status more than one time.¹⁹ 9.5% witnessed these remarks and behaviors towards people who spoke English as a second language, and 7% witnessed these towards TLGB people more than one time.¹⁹ In a study at one Canadian medical school, 31.1% of 103 medical students witnessed heterosexism and 14.6% witnessed anti-TLGB discrimination, where their student peers were the most common source of this heterosexism and discrimination, and attending or staff physicians were a distant second highest.²¹

Discomfort with medical school faculty was also reported in a few studies. Only 21.3% of 259 medical students at one United Kingdom medical school were comfortable sharing experiences of discrimination and harassment with a junior doctor member of the medical team, compared to 52.5% feeling comfortable to talk with another student.²⁰ Another study showed students tended not to disclose their sexual orientation to supervisors in the classroom or clinical setting.²¹ In a study of 84 mostly medical students, some nursing/other, only 35.5% were out, i.e. disclosed sexual orientation, to all professional colleagues compared to 75% being out to all friends.²² In a national study with 920 students with minoritized sexual and gender identities, students withheld sexual orientation/gender identities for fear of discrimination by faculty.¹¹ This fear was motivated by having experienced offensive comments or attitudes towards people with minoritized sexual and gender identity, as well as faculty's power over student evaluations.¹¹

There were also structural manifestations of negative climate for LGB student-faculty interaction. In a study of implicit and explicit bias at years one and four among students at 49 medical schools, the authors speculate that, "medical schools where unprofessional behavior is more common may be more likely to increase students' implicit bias, but independent of that relationship, students who notice and recall these instances may be more likely to have lower

implicit bias.”²⁵ In this study, higher year 4 explicit bias against gay men was associated with faculty role modeling of discriminatory behavior.²⁵ In the study of 84 mostly medical trainees, 31% disagreed that the campus provided a supportive climate for networking with TLGB mentors, which was described as critical to successful mentorship and a facilitator to future interest and success in academia.²²

That said, there were times where faculty-student interaction could yield positive results. From 1999 to 2011 there was an increase in students’ perceptions of race and sexual orientation equality in the course text content, professor’s delivery, and student-faculty interactions.²⁴ Medical trainees saw teachers as people who supported their academic career interests.²² Role models were strongly influential in students’ specialty choice for people both with and without minoritized sexual and gender identities.²⁸

2.1.2.2 Student-Faculty Interactions among Students of Color

In a narrative review of underrepresented minoritized students, multiple studies showed that African American students had more negative perceptions of their interactions with white faculty.¹³ Results from one qualitative study showed underrepresented minoritized students were ignored by faculty, residents, and staff physicians, experienced discrimination from faculty, and felt they were perceived as intellectually inferior.¹³ In a study across multiple medical institutions (or learning environments), 3% of white people compared to 68.4% of African American and 40% of Hispanic people experienced discrimination by instructors or supervisors.¹³ In a study of 20 Asian and Pacific Islander women medical students at a Northeastern Ohio University, a slight majority felt faculty saw them as too quiet.²⁹ One student was even assumed to have trouble showing empathy because of her Indian heritage.²⁹

Further, in a study with first-year underrepresented minoritized students felt less satisfied with responsiveness of faculty to students' concerns and were less likely to agree that students received enough constructive feedback.¹³ In another study, Black and minority ethnic students in a UK study were more likely to say that senior doctors believed in them and less likely to report support from senior doctors in pressured situations.³⁰ For Indigenous students, faculty role models were of utmost importance. In two personal stories and a focus group study, Indigenous physicians and trainees cite Indigenous or other role models of color as key to their success and retention in general and academic medicine.^{26,27,31} They likewise cited specific challenges when physician role models were absent like lack of shared understanding and experiences, uncertainty of how to pursue medical careers, and concerns about supporting family and community.^{26,27,31} Black men similarly reported the importance of physician role models.³²

Some studies showed positive student-faculty interactions. One study among African American students at the University of North Carolina in showed that students thought class advisors and administrators provided more social support.¹³ Another at a Pacific Northwest medical school showed that there were no significant differences in whether underrepresented minoritized students felt "accepted and respected by their peers, faculty, and administration" and felt the "university has achieved a positive and accepting climate for cultural differences" compared to their white peers.¹³ In a qualitative study investigating contributors to Black men's completion of college at a Florida University, support from advisors and mentors was seen as a way to share guidance, build confidence in their ability, and share success stories of other students from similar backgrounds.³²

2.1.3 Student-Student Interactions

2.1.3.1 LGB Student-Student Interactions

LGB students also experience discrimination from their peers. Students in a survey across all allopathic and osteopathic medical schools in the United States and Canada reported fear of discrimination by their peers on the basis of their TLGB identity, often as offensive comments or remarks and often from conservative or religious students.¹¹ In a survey of 103 medical students at one Canadian medical school, 31.1% witnessed heterosexism and fellow students were the most common source of heterosexism.²¹ These findings were mirrored in another survey of medical, physician assistant, and physical therapy students at one medical school. 34% of students witnessed other students or residents make disparaging remarks or exhibit offensive behaviors toward people who speak English as a 2nd language and people of low SES, 28% towards racially/ethnically minoritized students, and 25% towards TLGB students one or more times.¹⁹

However, literature also shows that students may find support in their peer relationships, although this has not been explicitly tested. Minority stress theory suggests that outness is a factor that is positively associated with mental health among LGB adults.³³ In the study of students at the Canadian medical school, no students concealed their sexual orientation from all of their classmates suggesting LGB students did not have to conceal their sexual orientation at all times.²¹ 51.4% of LGB students shared their sexuality with all classmates and 48.6% were out to some.²¹ Another survey of 84 TLGB, mostly medical trainees, alongside some nursing and other healthcare trainees, showed 75% were out, i.e. disclosed sexual orientation, to all of their friends.²² In a survey of medical students at one United Kingdom medical school, students felt most comfortable talking to another student about discrimination and harassment.²⁰ This study, however, did not provide findings specific to LGB students.

2.1.3.2 Student-Student Interactions among Students of Color

Results from one qualitative study included in a narrative review of underrepresented minoritized student experiences found that these students felt socially isolated and had difficulty forming study groups with their well-represented white and Asian peers.¹³ Another study included in the review corroborated these findings, where underrepresented students (25.4%) were more likely to have trouble establishing peer support networks than white students (14.5%).¹³ Underrepresented minoritized students in another single institution survey said they had more negative interactions with white peers than their African American peers.¹³

These challenges are significant because of the importance of peer support for racially minoritized students. In a study with Black and minority ethnic students in the United Kingdom, student peers were key to practical support and advice, solidarity, and understanding and emotional support.³⁰ Similarly, in a qualitative study of Black male medical students, peers with whom they could relate and work together through medical school were important to their completion of school.³²

2.1.4 Emotional Climate and Well-being

2.1.4.1 Emotional Climate and Well-being among LGB Students

Only one study investigated how learning environment directly impacts well-being outcomes. The study of 1,334 osteopathic medical students showed four times, 43.9%, as many LGB medical students indicated discomfort disclosing sexual orientation compared to their heterosexual counterparts, 16.7%, and discomfort was slightly correlated with worse perceptions of learning environment.¹² Double the number of LGB students, 22.5%, reported depression compared to their heterosexual counterparts, 11.8%.¹²

Many studies understand welcoming learning environment as related to whether LGB medical students and healthcare trainees disclose their sexual orientation.^{11,21,22} Though discomfort disclosing sexual orientation is not directly a well-being outcome, minority stress theory suggests that identity concealment leads to adverse mental health outcomes and may thus reflect safety of the learning environment.³³ However, it is important to note that absence of a threat does not equate to inclusion or positive experiences of learning environment – it could equally well mean something as minimal as “less bad.” Percentage of students out ranged from everybody being out to at least some of their friends,²¹ to 25% not out to all of their friends and 65.5% concealing identity from at least some professional colleagues,²² to 53.3% of bisexual students and 92.2% of questioning students concealing their identity.¹¹ In multiple studies, medical students said their top reason for concealing their sexual orientation was because they felt it was not anyone’s business.^{11,21} Concerns about being stereotyped or discriminated against always appeared second or third among the top three reasons for concealing identity in these studies.^{11,21,22} Lack of institutional presence of LGB people, institutional assumption of heterosexual student body, social/cultural norms, perceived religious or conservative nature of an institution were also considered reasons for concealing sexual identity, and concerns about future career options.¹¹ Survey responses indicated that progression through medical school did not promote disclosure.¹¹

2.1.4.2 Emotional Climate and Well-being among Students of Color

Underrepresented minoritized students experience less supportive social environments compared to their white peers.¹³ In a narrative review, three of four articles addressing social environment and social support showed African American students reported more negative perceptions compared to white people.¹³ In another study, underrepresented minoritized students reported higher levels of stress because of their minoritized status.¹³ Black and minority ethnic

students in a UK study felt that they did not receive the support they needed or were blamed for problems out of their control because struggling in medical school was seen as a sign of weakness.³⁰ They had a hard time getting emotional support from their support networks because of the demanding nature of medical training and reported lowered confidence, social isolation, and burnout.³⁰

For Indigenous students, representation could have positive or negative effects on their emotional experience in medical school. Joy Andrade²⁷ cited the well-representation of Kanaka ‘Ōiwi students facilitated her success in her journey to becoming a doctor. On the other hand, Indigenous focus group respondents from other schools noted that lack of representation at their schools exacerbated feelings of isolation and tokenism.²⁶

2.2 The Silencing of Lesbian, Gay, and Bisexual Medical Students of Color

Underrepresented in literature on LGB learning environment are the voices of LGB medical students of color. In LGB literature, study respondents were disproportionately white, ranging from 61.1% to 83% white, and in literature of color, sexual orientation was not reported at all. In the 10 LGB studies reviewed, only one highlighted findings among LGB medical students of color.¹¹ Erasing the voices of racially marginalized LGB medical students under the umbrella of LGB medical students misses the racism that can permeate LGB inclusion narratives. This is evident especially in one study, where students: diminished the importance of racial/ethnic identities, “The School of Medicine should define diversity based on socio-economic status and history rather than... race and ethnicity. Those [attributes] are not a true representation of students' pasts, presents, and futures;" framed diversity initiatives as creating dichotomous winners or

losers, “Our school's [diversity] efforts are so focused on racial and ethnic minorities that other aspects of diversity are being excluded;” and adopted “race-neutral” approaches to diversity, “Rather than singling individuals out because of race, religion, sexual preference, or gender, the SOM ought to promote a climate of acceptance towards all beliefs - this means creating a culture that does not promote one political or religious view over another.”¹⁹ All of these narratives are rooted in racism and further marginalize LGB medical students of color.⁶

3.0 Methods

Using secondary data from the Association of American Medical Colleges' (AAMC) Year 2 Questionnaire, we investigated how learning environment and quality of life differed by sexual orientation and racial identities, and whether different perceptions of learning environment were associated with quality of life outcomes among a sample of second-year US medical students. The AAMC administers this annual survey to all active, second-year medical students.³⁴ Students answer questions relating to learning environment, adjustment to medical school, and future career plans. Results are analyzed and presented in aggregated form on a national report.³⁵ The stated goal of the survey is to, "help medical schools understand the climate and culture of medical education."

For this current study, we hypothesize that:

1. LGB medical students will have poorer perceptions of learning environment compared to heterosexual medical students. Medical students of color will have poorer perceptions of learning environment compared to white medical students. These findings will be exacerbated among LGB medical students of color.
2. LGB medical students will have poorer quality of life compared to heterosexual people. Medical students of color will have poorer quality of life compared to white medical students. These findings will be exacerbated among LGB medical students of color.
3. Poorer perceptions of learning environment will predict lower quality of life and that these findings will be worse among LGB medical students compared to heterosexual medical students, medical students of color compared to white

medical students, and among LGB medical students of color compared to white LGB medical students.

4. For hypotheses 1-3, we also hypothesize that underrepresented students will have more negative perceptions of learning environment and quality of life compared to their well-represented peers.

The information gleaned from this study will add more to the literature on what is known about the relationship between learning environment and well-being for students with minoritized social identities. The Institutional Review Board of the University of Pittsburgh approved the current study.

3.1 Study Populations

All respondents to the survey were active second-year medical students enrolled at a Liaison Committee on Medical Education (LCME) accredited school were invited to participate in the survey by the Association of American Medical Colleges. We included responses from the 2016, 2017, and 2018 Year 2 Questionnaires, which had response rates of 59.5%, 63.5%, and 64.3% respectively. More details about the inclusion criteria for the Year 2 Questionnaire is provided elsewhere.³⁵ For our current study, we excluded any students who did not report their sexual orientation or racial identity.

3.2 Measures

3.2.1 Race and Sexual Orientation

The 2016-2018 Year 2 Questionnaires asked medical student respondents to self-report Lesbian or Gay, Bisexual, or heterosexual identity. We dichotomized sexual orientation categories into an LGB group and a heterosexual group. The Year 2 Questionnaire further asks students to self-identify their racial/ethnic identities from the ethnic categories listed in Table 1. Table 1 describes how we condensed the 33 AAMC’s racial/ethnic categories into six broad racial groups: Black, Hispanic, Indigenous, Asian, white, and Other. Based on medical student demographics, we considered Black, Hispanic, and Indigenous racial groups underrepresented and Asian and white groups well-represented.³⁶ “Other” group was considered well-represented for more conservative analyses.

Table 1: Building Racial Groups by Representation and Ethnic Category

Under- vs. Well-represented	Study Racial Categories	AAMC Racial/Ethnic Categories
Underrepresented	Black	B00 Black or African American (Category) B01 African B02 African American B03 Afro-Caribbean B04 Other Black or African American
	Hispanic	H00 Hispanic, Latino, or of Spanish Origin (Category) H01 Argentinean H02 Colombian H03 Cuban H04 Dominican H05 Mexican, Mexican American, Chicano/Chicana H06 Other Hispanic, Latino, or of Spanish Origin H07 Peruvian H08 Puerto Rican

Table 1 Continued

	Indigenous	I00 American Indian or Alaska Native I01 Tribal Affiliation P00 Native Hawaiian or Other Pacific Islander (Category) P01 Guamanian P02 Guamanian or Chamorro P03 Native Hawaiian P04 Other Pacific Islander P06 Samoan
Well-represented	Asian	A00 Asian (Category) A01 Other Asian A02 Bangladeshi A03 Cambodian A04 Chinese A05 Filipino A06 Indian A08 Indonesian A09 Japanese A10 Korean A11 Laotian A13 Pakistani A14 Taiwanese A15 Vietnamese
	White	W00 White
	Other	X00 Other

The Asian racial group included South and East Asian ethnicities. The Black racial group included people across African and African-diaspora ethnic identities. We grouped people selecting American Indian or Alaska Native and/or Native Hawaiian or Other Pacific Islander ethnic categories into one “Indigenous” group even if they had mixed Indigenous-white racial identities. We made this decision for two reasons. First, we grouped these students to increase the power of our analyses. Second, each of the Indigenous ethnic categories provided on the Year 2 Questionnaire (Table 1) share the experience of United States and European colonization, which includes a legacy of genocide, forced assimilation, and erasure that may limit the number of people who can select Indigenous identities alone.^{37–40} Indigenous-Asian, Indigenous-Black, and Indigenous-Hispanic multiracial identities were grouped into a Multiracial Underrepresented Minoritized group described below. Finally, while “Hispanic” is considered an ethnic identity by

the U.S. Census Bureau, we included Hispanic people as a separate racial group because of their underrepresentation in medical school independent of their racial identity.³⁶

If the student respondent's selected ethnicities fell entirely in one of the racial groups we designated, we coded them as "(Race) Alone." For people with ethnicities in multiple racial groups, we created two multiracial groups – Multiracial Well-represented people and Multiracial Underrepresented Minoritized people. The distinction was dependent on whether their multiple identities were only well-represented, i.e. white and Asian, or whether any of their identities were underrepresented, i.e. Black, Hispanic, and Indigenous, in medical school demographic composition.³⁶ As we could not ascertain whether people selecting Multiracial "Other" racial identity would be categorized as a well-represented or underrepresented racial group, we considered well-represented for more conservative analyses.

3.2.2 Perceptions of Learning Environment

Perceptions of learning environment were measured using a shortened version of the Medical School Learning Environment Survey.⁴¹ This questionnaire was originally developed and validated to evaluate the medical school learning environment and to be used as input in decision-making processes.⁴¹ The questionnaire was more recently validated in a Canadian sample, with measures meeting the minimally acceptable criterion of 0.7.⁴² The Year 2 Questionnaire All Schools Summary Report reports Cronbach's Alpha reliability estimates for 2016-2018 at 0.8 or greater, indicating the instrument is reliable in the sample overall.³⁵ The measure has not been validated extensively among people with minoritized sexual orientations and racial identities, though one study validated the survey among Brazilian medical students, which may show promise for minoritized students in the United States.⁴³

The shortened survey assesses three dimensions of medical school learning environment: student-faculty interaction, student-student interaction, and emotional climate. The student-faculty interaction score assesses perceptions of faculty supportiveness; the student-student interaction score assesses peer relations; and the emotional climate score assesses affective response to the learning environment. Component questions are presented in the table below:

Table 2: Perception of Learning Environment Scales and Component Questions

Measure, Component Questions	Scale Range
Student-Faculty Interaction	0-20
1. Faculty are helpful to students seeking advice not directly related to academic matter	
2. When giving criticism or answering a question, faculty are genuinely interested in helping the student	
3. Faculty and administrators give personal help to students having academic difficulty	
4. Faculty are reserved and distant with students	
Student-Student Interaction	0-20
1. Students in the school get to know each other well	
2. Students spend time assisting each other	
3. Students gather together in informal activities	
4. Students in the school are distant with each other	
Emotional Climate	0-15
1. The educational experience makes students value themselves	
2. The educational experience makes students feel a sense of achievement	
3. The educational experience makes students feel confident of their academic abilities	

Students indicated on the scales from zero to five how often they experienced each of the above measures: never, almost never, sometimes, fairly often, very often, always. Student-faculty and student-student distance questions were reverse coded. Individual responses were summed for scores that could range from 0-20 for student-faculty and student-student interaction, and 0-15 for emotional climate, with higher scores reflecting more positive perceptions.

3.2.3 Quality of Life

The Year 2 Questionnaire measured quality of life using the Quality of Life Scale from the Linear Analog Self-Assessment.⁴⁴ The questionnaire has been extensively validated and reproduced in various settings.⁴⁴ The Year 2 Questionnaire All Schools Summary Report reports Cronbach's Alpha reliability estimates for 2016-2018 at 0.9, indicating the instrument is reliable for the sample overall.³⁵

Each question prompt stated, "Please select the number best reflecting your response to the following that describe your feelings during the past week, including today. How would you describe: ..." The survey measured overall quality of life, level of social activity, and mental, physical, emotional, and spiritual well-being. Responses were reported on a scale from 0 (as bad as it can be) to 10 (as good as it can be). Final scale scores ranged from 0-60 with higher scores reflecting better quality of life.

3.3 Statistical Analysis

Analyses were performed using IBM SPSS Statistics for Macintosh, Version 26. We ran three Multivariate Analysis of Variance models to test our first hypothesis that perceptions of learning environment would be lower by minoritized racial and sexual identities. The first model defined sexual orientation alone as the predictor variable and the three learning environment measures as outcome variables. We defined heterosexual medical students as the reference group in this model. In the second model, we defined racial identity alone as the predictor variable and the three learning environment measures as outcome variables. White medical students were the

reference group in this model. In the last model with only LGB medical student respondents, we defined racial identity as the predictor variable and the three learning environment measures as outcome variables. In this model, white LGB students were the reference group. In all models we included sex, age, school region, and whether students attended classes in-person as covariates. Hypothesis tests were two-sided.

We ran three Univariate Analysis of Variance models to test our second hypothesis that quality of life would be poorer among people with minoritized sexual orientation and racial identity. The first model defined sexual orientation as the predictor variable and quality of life as the outcome variable. We defined heterosexual medical students as the reference group in this model. In the second model, we defined racial identity alone as the predictor variable and quality of life as the outcome variable. White medical students were the reference group in this model. In the last model with LGB medical student respondents only, we defined racial identity as the predictor variable and quality of life as the outcome measure. In this model, white LGB students were the reference group. In all models we included sex, age, school region, and whether students attended classes in-person as covariates. Hypothesis tests were two-sided.

Finally, to test our hypotheses that perceptions of learning environment would predict quality of life outcomes, we used Multivariable Linear Regression. We included our original covariates, sex, age, school region, and in-person attendance, and added sexual orientation and racial identity as covariates for the baseline regression. The baseline regression added covariates then each learning environment variable in stepwise fashion.

In separate regressions we used SPSS PROCESS v3.4 to consider possible moderation of the relationship between each learning environment variable (predictor) and quality of life (outcome) by sexual orientation and race. The first regression tested moderation by sexual

orientation, controlling for racial identity and original covariates. The second regression tested moderation by race, controlling for sexual orientation and original covariates. The third regression tested moderation by race in the LGB-only medical student sample controlling only for original covariates.

4.0 Findings

4.1 Demographics

Our final study sample included 34,679 second-year medical students. We excluded 3,808 students who did not report their sexual orientation and 1,113 who did not report their racial or ethnic identity. Table 3 shows overall demographics and demographics by sexual orientation for our final sample.

Table 3: Second Year Medical Student Demographics 2016-2018

	LGB n (%)	Heterosexual n (%)	Total n (%)
Sexual Orientation			
LGB	2767 (100)	-	2767 (8.0)
Heterosexual	-	31912 (100)	31912 (92.0)
Race			
Asian alone	444 (16.0)	6536 (20.5)	6980 (20.1)
Black alone	173 (6.3)	1978 (6.2)	2151 (6.2)
Hispanic alone	196 (7.1)	1669 (5.2)	1865 (5.4)
Indigenous	19 (0.7)	262 (0.8)	281 (0.8)
White alone	1623 (58.7)	18390 (57.6)	20013 (57.7)
Other alone	34 (1.2)	637 (2.0)	671 (1.9)
Multiracial, Underrepresented	179 (6.5)	1456 (4.6)	1635 (4.7)
Multiracial, Well-represented	99 (3.6)	984 (3.1)	1083 (3.1)
Sex			
Male	1411 (51.0)	15108 (47.3)	16519 (47.6)
Female	1353 (49.0)	16803 (52.7)	18156 (52.4)
Age			
Under 21	2 (0.1)	41 (0.1)	43 (0.1)
21-24	1417 (51.2)	19158 (60.0)	20575 (59.3)
25-29	1148 (41.5)	10934 (34.3)	12082 (34.8)
Over 29	200 (7.2)	1779 (5.6)	1979 (5.7)
Region			
Central	695 (25.1)	8942 (28.0)	9637 (27.8)
Northeast	867 (31.3)	8484 (26.6)	9351 (27.0)
South	810 (29.3)	11077 (34.7)	11887 (34.3)
West	395 (14.3)	3409 (10.7)	3804 (11.0)
Attend In-Person			
Almost Never	669 (24.3)	7290 (23.0)	7959 (23.1)
Occasionally or Somewhat Often	867 (31.4)	9264 (29.2)	10131 (29.4)
Often or Most of the time	1222 (44.3)	15201 (47.9)	16423 (47.6)

Table 3 Continued

Average Student-Faculty Interaction Score (SD)	14.46 (3.28)	14.84 (3.17)	14.81 (3.18)
Average Student-Student Interaction Score (SD)	14.55 (3.24)	14.87 (3.11)	14.85 (3.12)
Average Emotional Climate Score (SD)	8.64 (3.20)	9.28 (3.11)	9.22 (3.12)
Average Quality of Life Score (SD)	38.52 (10.25)	40.73 (9.99)	40.55 (10.03)

Eight percent of students are LGB and 92% of students are heterosexual. Among the LGB students, 58.7% are white, 1.2% Other, and 40.1% People of Color. Within these racial groups, 79.5% of the sample was well-represented in medical school, while 20.5% were underrepresented racially minoritized students.

There were slightly more male LGB students (51%, n= 1411) than female LGB students (49%, n=1353) and most LGB students were between the ages of 21-29 (92.7%, n=2565). Most of our LGB respondents lived in the Northeast (31.3%, n=867) and the West was home to the least number of LGB students (n=395, 14.3%). The majority of LGB student respondents attended in-person pre-clerkship courses/lectures at their medical school at least occasionally (75.7%, n=2089).

4.2 Perceptions of Learning Environment

4.2.1 Student-Faculty Interaction

Findings for student-faculty interaction by sexual orientation and race alone are reported in Table 4. As hypothesized, LGB students reported more negative average perceptions of student-faculty interaction than their heterosexual peers (β : -0.36; CI: -0.49, -0.23). Similarly, almost every racially minoritized group reported on average more negative student-faculty interaction than their

white peers, with the exception of Indigenous people, who reported no significant differences from white people. Asian people had the greatest magnitude of difference (β : -0.58; CI: -0.67, -0.49), followed by Black people (β : -0.49; CI: -0.64, -0.35), people with Other racial identity (β : -0.46; CI: -0.71, -0.21), Hispanic people (β : -0.39; CI: -0.55, -0.24), Multiracial, well-represented people (β : -0.28; CI: -0.48, -0.09), and finally Multiracial, underrepresented people (β : -0.19; CI: -0.35, -0.03).

Table 4: Student-Faculty Interaction by Sexual Orientation and Race

	Mean (SD)	Coefficient (95% CI)	p-value
Sexual Orientation			
LGB (n=2639)	14.46 (3.28)	-0.36 (-0.49, -0.23)	p<0.001
Heterosexual (n=30230)	14.84 (3.17)	ref	ref
Race			
Asian (n=6620)	14.40 (3.23)	-0.58 (-0.67, -0.49)	p<0.001
Black (n=2015)	14.48 (3.3)	-0.49 (-0.64, -0.35)	p<0.001
Hispanic (n=1753)	14.62 (3.42)	-0.39 (-0.55, -0.24)	p<0.001
Indigenous (n=267)	15.24 (3.07)	0.23 (-0.15, 0.61)	0.23
Other (n=633)	14.52 (3.53)	-0.46 (-0.71, -0.21)	p<0.001
Multiracial, Underrepresented (n=1528)	14.83 (3.30)	-0.19 (-0.35, -0.03)	0.02
Multiracial, Well-represented (n=1039)	14.71 (3.08)	-0.28 (-0.48, -0.09)	0.005
White (n=19014)	15.02 (3.09)	ref	ref

Results by race within sexual orientation are reported in Table 5. When we disaggregated our LGB sample by race, negative student-faculty interactions were greater among LGB people with Other (β : -1.33; CI: -2.48, -0.18), Asian (β : -1.05; CI: -1.40, -0.70), Multiracial, Underrepresented (β : -0.75; CI: -1.26, -0.23), and Black (β : -0.69; CI: -1.21, -0.17) racial identity compared to their white LGB peers. LGB Hispanic, Indigenous, and Multiracial well-represented

students did not have additional negative perceptions beyond those of their sexual orientation and/or racial groups.

Table 5: Student-Faculty Interaction by Race within Sexual Orientation

	Mean (SD)	Coefficient (95% CI)	p-value
LGB by Race			
Asian (n=422)	13.68 (3.38)	-1.05 (-1.40, -0.70)	p<0.001
Black (n=165)	14.02 (3.49)	-0.69 (-1.21, -0.17)	0.009
Hispanic (n=185)	14.59 (3.57)	-0.16 (-0.66, 0.33)	0.52
Indigenous (n=18)	13.94 (3.52)	-0.83 (-2.33, 0.68)	0.28
Other (n=31)	13.29 (3.72)	-1.33 (-2.48, -0.18)	0.02
Multiracial, Underrepresented (n=170)	13.99 (3.27)	-0.75 (-1.26, -0.23)	0.004
Multiracial, Well-represented (n=94)	14.89 (3.08)	0.15 (-0.52, 0.83)	0.66
White (n=1554)	14.76 (3.15)	ref	ref

4.2.2 Student-Student Interaction

Findings for student-student interaction by sexual orientation and race alone are reported in Table 6. LGB people reported average perceptions 0.25 (CI: -0.49, -0.23) points more negative for student-student interaction compared to their heterosexual peers. Racially minoritized students likewise perceived more negative peer interaction compared to their privileged white peers, and on greater magnitudes overall. Hispanic medical students had the most negative perceptions of student-student interaction (β : -0.94; CI: -1.09, -0.79), closely followed by Black students (β : -0.90; CI: -1.04, -0.76), then Asian (β : -0.75; CI: -0.83, -0.66), Other (β : -0.66; CI: -0.83, -0.42), Indigenous (β : -0.51; CI: -0.88, -0.14), Multiracial well-represented (β : -0.47; CI: -0.67, -0.28), and lastly Multiracial underrepresented students (β : -0.38; CI: -0.54, -0.22).

Table 6: Student-Student Interaction by Sexual Orientation and Race

	Mean (SD)	Coefficient (95% CI)	p-value
Sexual Orientation			
LGB (n=2639)	14.55 (3.24)	-0.25 (-0.38, -0.13)	p<0.001
Heterosexual (n=30230)	14.87 (3.11)	ref	ref
Race			
Asian (n=6620)	14.43 (3.16)	-0.75 (-0.83, -0.66)	p<0.001
Black (n=2015)	14.24 (3.24)	-0.90 (-1.04, -0.76)	p<0.001
Hispanic (n=1753)	14.16 (3.46)	-0.94 (-1.09, -0.79)	p<0.001
Indigenous (n=267)	14.62 (3.37)	-0.51 (-0.88, -0.14)	0.007
Other (n=633)	14.45 (3.49)	-0.66 (-0.83, -0.42)	p<0.001
Multiracial, Underrepresented (n=1528)	14.77 (3.27)	-0.38 (-0.54, -0.22)	p<0.001
Multiracial, Well-represented (n=1039)	14.67 (3.18)	-0.47 (-0.67, -0.28)	p<0.001
White (n=19014)	15.15 (2.99)	ref	ref

Findings for race within sexual orientation are reported in Table 7. People with Other racial identity had more negative perceptions of student-student interaction compared to their white LGB peers (β : -1.81; CI: -2.95, -0.68), as did Indigenous (β : -1.77; CI: -3.26, -0.29), Asian (β : -1.01; CI: -1.36, -0.66), Black (β : -0.95; CI: -1.46, -0.44), and Multiracial Underrepresented (β : -0.54; CI: -1.05, -0.03) people. LGB Hispanic and Multiracial well-represented people did not have exacerbated differences beyond their sexual orientation and/or racial groups.

Table 7: Student-Student Interaction by Race within Sexual Orientation

	Mean (SD)	Coefficient (95% CI)	p-value
LGB by Race			
Asian (n=422)	13.84 (3.30)	-1.01 (-1.36, -0.66)	p<0.001
Black (n=165)	13.89 (3.28)	-0.95 (-1.46, -0.44)	p<0.001
Hispanic (n=185)	14.60 (3.39)	-0.20 (-0.69, 0.29)	0.42
Indigenous (n=18)	13.06 (3.35)	-1.77 (-3.26, -0.29)	0.02
Other (n=31)	12.90 (3.75)	-1.81 (-2.95, -0.68)	0.002
Multiracial, Underrepresented (n=170)	14.29 (3.47)	-0.54 (-1.05, -0.03)	0.04
Multiracial, Well-represented (n=94)	14.90 (3.31)	0.03 (-0.64, 0.69)	0.94
White (n=1554)	14.87 (3.10)	ref	ref

4.2.3 Emotional Climate

Findings for emotional climate by sexual orientation and race alone are reported in Table 8. LGB students had a significantly more negative perception of the emotional climate than their heterosexual peers (β : -0.60; CI: -0.72, -0.48). In contrast, racially minoritized students generally showed no difference in perceptions of emotional climate except for Asian students (β : -0.12; CI: -0.20, -0.03).

Table 8: Emotional Climate by Sexual Orientation and Race

	Mean (SD)	Coefficient (95% CI)	p-value
Sexual Orientation			
LGB (n=2639)	8.64 (3.20)	-0.60 (-0.72, -0.48)	p<0.001
Heterosexual (n=30230)	9.28 (3.11)	ref	ref
Race			

Table 8 Continued

Asian (n=6620)	9.13 (3.07)	-0.12 (-0.20, -0.03)	0.009
Black (n=2015)	9.10 (3.17)	-0.11 (-0.25, 0.03)	0.13
Hispanic (n=1753)	9.23 (3.23)	-0.02 (-0.17, 0.13)	0.78
Indigenous (n=267)	9.61 (3.43)	0.36 (-0.01, 0.73)	0.06
Other (n=633)	9.01 (3.38)	-0.24 (-0.48, 0.01)	0.06
Multiracial, Underrepresented (n=1528)	9.17 (3.18)	-0.09 (-0.25, 0.07)	0.26
Multiracial, Well-represented (n=1039)	9.08 (3.12)	-0.16 (-0.35, 0.34)	0.11
White (n=19014)	9.29 (3.10)	ref	ref

Table 9 reports the findings for race within sexual orientation. There were no significant differences between white LGB people and racially minoritized LGB people beyond those of their racial and/or sexual orientation groups alone.

Table 9: Emotional Climate by Race within Sexual Orientation

	Mean (SD)	Coefficient (95% CI)	p-value
LGB by Race			
Asian (n=422)	8.37 (3.19)	-0.32 (-0.66, 0.03)	0.07
Black (n=165)	8.39 (3.18)	-0.28 (-0.79, 0.23)	0.28
Hispanic (n=185)	8.92 (3.36)	0.22 (-0.27, 0.70)	0.38
Indigenous (n=18)	8.56 (3.71)	-0.16 (-1.63, 1.31)	0.83
Other (n=31)	8.10 (3.31)	-0.48 (-1.61, 0.64)	0.40
Multiracial, Underrepresented (n=170)	8.25 (3.22)	-0.42 (-0.92, 0.08)	0.10
Multiracial, Well-represented (n=94)	8.86 (3.36)	0.15 (-0.51, 0.81)	0.65
White (n=1554)	8.75 (3.16)	ref	ref

4.3 Quality of Life

Table 10 shows well-being by sexual orientation and race. LGB people reported differences of -2.13 (CI: -2.52, -1.74) points more negative than the average Quality of Life score among heterosexual people. Indigenous people had the most negative reports of quality of life compared to white people (β : -1.94; CI: -3.12, -0.76), followed by people with Other racial identity (β : -0.79; CI: -1.56, -0.01) and Asian people (β : -0.38; CI: -0.65, -0.10). All other racially minoritized groups did not have significantly different Quality of Life Scores from white people.

Table 10: Quality of Life by Sexual Orientation and Race

	Mean (SD)	Coefficient (95% CI)	p-value
Sexual Orientation			
LGB (n=2699)	38.52 (10.25)	-2.13 (-2.52, -1.74)	p<0.001
Heterosexual (n=31375)	40.73 (9.99)	ref	ref
Race			
Asian (n=6858)	40.33 (10.07)	-0.38 (-0.65, -0.10)	0.008
Black (n=2112)	40.18 (10.30)	-0.30 (-0.75, 0.15)	0.19
Hispanic (n=1836)	40.41 (10.75)	-0.25 (-0.73, 0.23)	0.30
Indigenous (n=277)	38.71 (10.40)	-1.94 (-3.12, -0.76)	0.001
Other (n=660)	39.86 (11.05)	-0.79 (-1.56, -0.01)	0.05
Multiracial, Underrepresented (n=1599)	40.63 (10.08)	-0.03 (-0.54, 0.48)	0.92
Multiracial, Well-represented (n=1064)	40.43 (10.21)	-0.21 (-0.82, 0.41)	0.51
White (n=19668)	40.74 (9.85)	ref	ref

Table 11 shows findings by race within sexual orientation. There were no significant differences between racially minoritized and white LGB people beyond those of their sexual orientation and/or racial groups.

Table 11: Quality of Life by Race within Sexual Orientation

	Mean (SD)	Coefficient (95% CI)	p-value
LGB by Race			
Asian (n=430)	37.64 (10.68)	-0.91 (-2.01, 0.19)	0.10
Black (n=170)	37.68 (10.62)	-0.90 (-2.51, 0.72)	0.28
Hispanic (n=194)	38.98 (10.47)	0.33 (-1.20, 1.86)	0.67
Indigenous (n=19)	35.00 (10.07)	-3.55 (-8.16, 1.07)	0.13
Other (n=34)	39.00 (11.75)	0.59 (-2.88, 4.06)	0.74
Multiracial, Underrepresented (n=177)	38.47 (9.94)	-0.08 (-1.67, 1.51)	0.92
Multiracial, Well-represented (n=98)	39.78 (10.42)	1.14 (-0.94, 3.23)	0.28
White (n=1577)	38.75 (10.04)	ref	ref

4.4 Regression and Moderation

Table 12 shows the results of our stepwise regression with student-faculty interaction, student-student interaction, and emotional climate as predictor variables, and quality of life as the dependent variable. Model 1 accounts for the effect of covariates alone, and models 2-4 add each predictor variable in a stepwise fashion. At baseline, when all predictors are accounted for, 25.5% of variance in quality of life score was explained by learning environment predictors. Model 1 results demonstrate that covariates had statistically significant effects in the model, though at a low level. Results in subsequent models demonstrate that all learning environment predictors have an effect on the quality of life outcome variable. All models statistically significant.

Table 12: Stepwise Regression Results for Learning Environment and Quality of Life

	1	2	3	4
Constant	39.704*** (0.433)	24.307*** (0.460)	19.068*** (0.467)	20.878*** (0.448)
Sex	-1.285*** (0.111)	-1.027*** (0.104)	-1.217*** (0.101)	-0.914*** (0.097)
Age	-0.810*** (0.092)	-0.692*** (0.086)	0.437*** (0.084)	-0.351*** (0.080)
Race	0.069** (0.026)	-0.034 (0.024)	-0.118*** (0.023)	-0.046* (0.022)
School Region	0.214*** (0.056)	0.073 (0.052)	0.088 (0.051)	0.089 (0.049)
Sexual Orientation	0.232*** (0.023)	0.186*** (0.021)	0.180*** (0.021)	0.133*** (0.020)
Attend in Person	0.536*** (0.034)	0.291*** (0.032)	0.22*** (0.032)	0.117*** (0.030)
Student-Faculty Interaction		1.142*** (0.016)	0.745*** (0.019)	0.156*** (0.021)
Student-Student Interaction			0.779*** (0.019)	0.503*** (0.019)
Learning Environment Emotional Climate				1.153*** (0.021)
R-squared	0.017	0.145	0.187	0.255
Adjusted R-squared	0.017	0.145	0.187	0.255
No. of Observations	32510			

There was no significant moderation by sexual orientation, race, or race within sexual orientation for the relationship between learning environment emotional climate and quality of life. There was further no moderation by race alone or race within sexual orientation on the relationship between student-student interaction and quality of life.

However, there was significant moderation by sexual orientation on the relationship between student-student interaction and quality of life, with LGB students' quality of life more greatly impacted by perceptions of learning environment compared to heterosexual people (β : -0.015, CI: -0.027, -0.002; $p=0.02$). Further, there was significant moderation by race on the relationship between student-faculty and quality of life, with Asian students' quality of life less greatly impacted by perceptions of learning environment compared to white people (β : 0.017, CI: 0.003, 0.031; $p=0.02$). There was also significant moderation by LGB Hispanic identity on the relationship between student-faculty interaction and quality of life compared to LGB white people (β : 0.048, CI: 0.000, 0.097; $p=0.05$).

5.0 Discussion

5.1 Student-Faculty Interaction and Student-Student Interaction

Our hypotheses were confirmed that people with minoritized sexual orientation or racial identity would have less positive perceptions of student-faculty and student-student interaction. Our hypotheses were likewise confirmed that students with LGB racially minoritized identities would have exacerbated outcomes compared to their racial and/or sexual orientation groups alone. Our hypothesis that representation in medical school would protect against less negative perceptions of learning environment was largely not confirmed.

Consistent with other LGB literature,^{11,19–22,25,28} LGB second-year medical students had lower perceptions of student-faculty and student-student interactions than their heterosexual peers. These findings are important. Social support among LGB people is imperative to their well-being.⁴⁵ Chosen family research demonstrates that LGB people's friendships and chosen families hold an increased importance in their lives and life decisions.⁴⁶ Further, research among undergraduate LGB students and LGB students of color demonstrates that peer interactions, especially through student organizations, remain important for LGB student success.⁴⁷ These realities may explain in part our findings of exacerbated outcomes among LGB Black, Asian, Indigenous and Multiracial Underrepresented students.

Similarly, consistent with the literature on racially minoritized students' perceptions of learning environment, nearly every racial group significantly differed from white students on both student-faculty interactions and student-student interactions.^{13,26,27,29–32} Our literature review revealed that African American students attribute worse faculty interactions to feeling ignored,

discriminated against, perceived as intellectually inferior, and felt that faculty were less responsive and did not provide enough constructive feedback.¹³ Asian and Pacific Islander women medical students felt faculty saw them as too quiet.²⁹ Underrepresented minoritized (Black, Hispanic, Indigenous) students reported feeling socially isolated from their well-represented peers.¹³ Again these realities may explain in part our findings of exacerbated outcomes among LGB Black, Asian, Indigenous and Multiracial Underrepresented students.

Though research among LGB and racially minoritized people may offer insight into the experiences of LGB racially minoritized students, separately they are inadequate. Our findings are consistent with Intersectionality Theory: there is a differential reality between being a heterosexual racially minoritized person and a Queer racially minoritized person; it is different to be a white LGB person and to be a racially minoritized LGB person.¹⁴ LGB Black, Asian, and Multiracial Underrepresented students all had lower perceptions compared to their white LGB peers on student-faculty interaction, and these same groups plus LGB Indigenous students had lower perceptions of student-student interaction. In Section 5.5 we call for more research to explore experiences unique to racially minoritized LGB medical students.

Our findings around representation were particularly interesting because they run contrary to protective effects of well-representation demonstrated in previous literature.¹³ Asian students had some of the least positive student-faculty and student-student outcomes across sexual orientation. Firstly, Asian medical students still experience racism in the United States and in higher education where only white people are protected from racial oppression.⁶ Asian students in particular may face challenges to that social support via heterosexism and homophobia shaped by a cultural lens.⁴⁵ These experiences certainly impact student-faculty and student-student

interactions and could explain less positive findings among Asian students across sexual orientation.

Grouping Multiracial people by representation also yielded interesting results. Students in our novel Multiracial well-represented racial group had lower perceptions of student-faculty and student-student interactions compared to their Multiracial underrepresented peers when sexual orientation was not taken into consideration. However, when sexual orientation was considered, Multiracial well-represented LGB students reported better outcomes than their Multiracial underrepresented LGB peers (no significant differences vs. significantly lower perceptions). These findings suggest underrepresentation may be more impactful when racially minoritized people are also LGB.

5.2 Emotional Climate and Quality of Life

Our hypotheses were confirmed that people with minoritized sexual orientation would have less positive perceptions of learning environment emotional climate and quality of life. However, contrary to our hypotheses, people with minoritized racial identity and people with both minoritized racial identity and sexual orientation largely did not have less positive perceptions of learning environment emotional climate and quality of life. Further, well-representation did not ameliorate less positive perceptions despite our expectations.

Differences by sexual orientation were at their greatest magnitude for emotional climate compared to other learning environment outcomes. Further, the magnitude of difference in average quality of life score for LGB students was a full two points lower than heterosexual students. Literature among LGB medical students has consistently demonstrated lower perception of

learning environment emotional climate and quality of life.^{11,12,21,22} These findings are likely reflective in part of internal inequities in the medical school learning environment. As discussed in Section 2.2, faculty and students alike discriminate against LGB students.^{11,19–22,25} However, these findings are likely also reflective of inequitable circumstances that impact LGB people's emotional well-being beyond the medical school learning environment. Social stigma deeply impacts LGB people's well-being in everyday life.^{33,48} Multiple systematic reviews have associated this social hostility, stigma, and discrimination to increased substance use, self-harm, suicide/suicide ideation, and mental illness among LGB people, indicative of the difficulties of coping with the reality of structural heterosexism.^{49,50} We grapple with the limitations of this study in fully assessing the impact of internal/external circumstances in Section 5.4.

Unlike student-faculty and student-student interactions, racially minoritized students tended not to differ in perceptions of learning environment emotional climate and quality of life. There were two exceptions. Consistent with other literature, Indigenous students differed from white students on self-reported quality of life. In the limited literature available in medical education, well-being among Indigenous students was a factor of representation.^{26,27} When Indigenous people were well-represented at their medical schools, well-being was better, when they were underrepresented, well-being was worse.^{26,27} We suggest more research in Section 5.5 to more deeply explore the medical school experiences of Indigenous students.

Second, as with student-faculty and student-student interactions, findings among Asian students run contrary to previous literature. Asian students were the only racial group to have significantly different perceptions on both emotional climate and quality of life from white students, albeit small differences. There is extensive higher education literature that identifies potential reasons for differences in quality of life and feeling self-valuation, confident, and a sense

of achievement in their education experience, including how much Asian students have an established sense of ethnic background and what it means to them, and the extent to which Asian students acculturate (conform to dominant, i.e. white, racial values and norms) vs. enculturate (maintain racial values and norms of their native culture).^{51,52} Many studies draw attention to the impact of the model minority stereotype, i.e. the perception of Asian people as “successful in academics and work, self-sufficient, and mentally healthy.”⁵³ Sense of belonging among Asian American students is impacted by the model minority stereotype in the ways that it separates Asian students from other racially minoritized students.⁵⁴ We identified one qualitative study in medical education where Asian and Pacific Islander women medical students described stress associated with competition and achievement, compounded by the societal stereotype of Asian people as a “model minority.”²⁹ Even the conceptualization of Asian students as “overrepresented” in higher education ignores the ways Asian students are still underserved by campus support programs and resources, and underserved in higher education research.⁵⁴ All of these together could impact the significantly less positive perceptions of learning environment emotional climate and quality of life among Asian medical students.

5.3 Regression and Moderation

Our hypotheses that learning environment would associate with quality of life were confirmed. Once we accounted for each covariate and learning environment predictor, learning environment accounted for a full 25% of the variance in Quality of Life Score. This is hugely significant. Alongside the multitude of factors that can impact a person’s quality of life, identifying and addressing student concerns in the learning environment could significantly improve student

well-being. This is consistently shown in this study and other studies that directly link learning environment and quality of life outcomes: more positive student perceptions of learning, teachers, the atmosphere, and better academic and social self-perceptions are all associated with more positive quality of life.^{8,9}

With three exceptions, sexual orientation, race, and race within sexual orientation did not moderate the relationship between learning environment outcomes and quality of life. Consistent with our hypothesis, the relationship between student-student interaction and quality of life was strengthened among LGB students compared to heterosexual students. As above, student-student interaction is particularly important to LGB students as social support has a high impact on LGB people's well-being. These moderation findings reaffirm the relationship of peer interactions with LGB student well-being.

Surprisingly, the other two moderations demonstrated less strong associations among racially minoritized students. For Asian students and LGB Hispanic students, student-faculty relationships had a less strong impact on quality of life compared to their white and white LGB counterparts. These findings seem to indicate that faculty relationships are less important to well-being of Asian and LGB Hispanic students than to white students. This does not change, however, the worse findings among Asian students on learning environment and quality of life alone. These findings should therefore not be taken as indicative of positive perceptions of learning environment or positive quality of life. There are a multitude of factors we cannot understand by nature of the limitations discussed below.

5.4 Limitations

Study findings should be interpreted carefully and critically. First and foremost, the ways of capturing race are inherently flawed. Categorization of racial identity are manifestations of racism.⁵⁵ These categorizations are artificial and have been used to justify oppression against people with minoritized racial identity.⁵⁵ However, though abolition of racial identity categorization is a lofty goal, there are undeniable differences in realities among minoritized groups by virtue of their categorization that must be respected.⁵⁵ Holding these dual realities of racial categorization complicated the approach and interpretation of the study and findings.

The racial categories in this study could have been subdivided in a number of ways that may have captured inequity in differently. We decided to group American Indian/Alaska Native students and Native Hawaiian/Other Pacific Islander students into one big “Indigenous” racial group because of their shared legacy of colonization.^{37–40} For the same reason, we did not separate white and Indigenous multiracial identities. However, we still separated multiracial identities if they were Indigenous and racially minoritized, which reflects our previously limited understanding of the realities of settler colonialism. We also took a novel approach to creating Multiracial groups, dividing the groups by representation in medical schools. We did this thinking that representation in medical school may impact outcomes among students. Each of these decisions around categorization could be made differently – multiracial Indigenous identities could have been grouped all separately or all together, Multiracial groups could have been subdivided further or unified further. Deciding how to group students is complicated and imperfect and has implications on study findings, especially for Indigenous and Multiracial students.

Our findings are limited further because of the data we have. Among LGB Indigenous students, findings may be limited by power with only 18 people in the group. The survey has

around 60% response rates for each survey year (2016-2018), introducing volunteer bias where students who respond may be different from the 40% who do not respond to the survey. The missing 40% may also have different perceptions of learning environment and quality of life. Importantly, only second-year medical students were included for analysis in this study. Some studies show that after clinical years (years 3-4) there are increased problems with witnessing or experiencing discrimination,²⁰ and indoctrination into a discriminatory organizational culture.⁵⁶ Therefore, these findings may underestimate the impact of oppression in medical school learning environment.

Additionally, our findings are limited by the data we do not have. We cannot interpret findings among students who selected “Other” racial identity because we cannot understand differential reality by racial identity. Further, student-faculty and student-student interactions, and learning environment emotional climate and quality of life are shaped by more than the phenomena captured on the abbreviated scales used on the Year 2 Questionnaire. Interpretation of findings in this study is limited to what information we have on the scale, which are imperfect for explaining the nuances of learning environment and quality of life outcomes among racially and sexually minoritized students.

Lastly, this study is limited in its temporality. As a cross-sectional survey, it is impossible to assess the ways that external circumstances vs. realities of being in medical school play into our findings of lower perceptions of learning environment emotional climate and quality of life. It is unlikely that our findings stem wholly from LGB medical students’ experiences either inside or outside of medical school. This study is limited in that it cannot fully assess the degree to which internal and external circumstances are impacting student well-being.

5.5 Implications

At the beginning of this study we identified four areas in which the current literature could grow: adding findings from nationally representative datasets; investigating student well-being beyond mental health challenges; identifying modifiable structural outcomes to build beyond interpersonal outcomes; and exploring differential impacts among Lesbian, Gay, and Bisexual people of color compared to their white peers. Our study addresses each of these areas.

We used data from the Association of American Medical Colleges' nationally administered Year 2 Questionnaire for the years 2016-2018. Our dataset captured responses from 59.5-64.3% of all second-year medical students enrolled at all LCME-accredited medical schools across the nation. Our dataset included participants of a variety of ages, races, sexes, and sexual orientations. To our knowledge, this study represents the largest nationally representative dataset of Lesbian, Gay, and Bisexual medical students and Lesbian, Gay, and Bisexual medical students of Color in the published literature.

Well-being findings from this study go beyond outcomes of self-reported anxiety, depression, and/or other mental illness. Our study looked at quality of life as our well-being outcome of interest. The Quality of Life Scale investigates six areas of quality of life: overall quality of life, physical, mental, emotional, and spiritual well-being, and level of social activity. In using this scale, our study illustrates both mental and emotional well-being, which could capture anxiety, depression, stress findings from other studies, as well as more wellness-oriented perceptions of overall quality of life, social behaviors, and spiritual well-being.

This study not only describes differential experiences in quality of life, but also in how quality of life may associate with differences in perceptions of learning environment. Our study looked at both interpersonal interactions and the learning environment emotional climate, which

explicitly probes the impact of the educational experience on students' feelings of confidence, self-valuation, and sense of achievement. Through multivariable linear regression, we found that student-faculty interactions, student-student interactions, and emotional climate together accounted for 25% of the variance in quality of life score. These findings lay the foundation to identify potential interventions on both interpersonal interactions and the broader educational experience and medical school impact on student well-being.

Lastly, our findings were situated among Lesbian, Gay, and Bisexual medical students of color. To our knowledge, our study is one of few that investigates learning environment and quality of life while considering the multidimensionality of LGB student racial identities. In this study specifically, LGB people of color had significantly less positive perceptions of student-faculty and student-student interactions, differences that would not have been identified in racially aggregated samples. This study confirms what has largely been shown elsewhere: intersecting systems of heterosexism and racism mean that all-encompassing "LGBT" or "SGM" groups often do not adequately capture the experiences of LGB people of color. These findings have important implications for future research.

Future research should continue considering how to describe and improve well-being beyond presence/absence of mental health challenges. In this study, LGB students had worse perceptions of all dimensions of quality of life (see Appendix B). Future research should seek to understand why these perceptions are worse by working with LGB students. Future research should also work with LGB students on addressing differential challenges to well-being. For example, research could ask what defines well-being for LGB students and how can the medical school make sure to provide these needs.

Further, future research should continue to investigate the ways that the medical school also has a role in improving students' perceptions of learning environment and well-being. Each of our outcomes demonstrated more negative perceptions among minoritized students. Future research needs to continue understanding the nature of these negative perceptions and working to mitigate them. In this study we also showed an association between perceptions of learning environment and quality of life. This relationship should continue to be explored with the express purpose of making sure the medical school and people with power work on changing the inequitable experiences of minoritized students. For example, research studies could work alongside students to ask why their experiences are more negative and what they think could make them better, then turn to faculty and administrators to implement these suggestions.

Lastly, future research needs to continue considering the ways racial and sexual identities impact student perceptions of learning environment and quality of life. More research is needed to understand why white heterosexual and LGB students are protected from more negative perceptions of their learning environment compared to their peers of color. More research is needed to elevate heterosexual and LGB Indigenous student experiences of their faculty relationships and what experiences impact their well-being. Researchers should work to understand differences among heterosexual and LGB students who do not identify within federally constructed racial groups and how their counter-existence impacts their perceptions of student-faculty interactions, student-student interactions, and quality of life. More research should be done with Asian students across sexual orientation to understand their medical school experiences. More research should be done about the ways that representation comes to play in LGB vs. heterosexual groups. All future research should be working to eliminate each of these inequities by racial group and sexual orientation that we identified in our study. These can all be achieved by centering race,

that is asking questions about how race might impact our realities, in our LGB literature, coursework, and medical practices.

6.0 Conclusions

“The function, the very serious function of racism, is distraction. It keeps you from doing your work. It keeps you explaining, over and over again, your reason for being. Somebody says you have no language, so you spend twenty years proving that you do. Somebody says your head isn’t shaped properly, so you have scientists working on the fact that it is. Somebody says you have no art, so you dredge that up. Somebody says you have no kingdoms, so you dredge that up. None of that is necessary. There will always be one more thing.” – Toni Morrison, “A Humanist View,” from Portland State University’s Oregon Public Speakers Collection: “Black Studies Center public dialogue. Pt. 2,” May 30, 1975.

As we identify methods to improve learning environment and quality of life, we ought to do so with three things in mind. First, we must hold the system accountable as well as individuals.^{10,13} When LGB medical students of color feel distant from other students and faculty, we should consider the ways that the medical school does not encourage feelings of closeness among students and student-faculty relationships (see Appendix B) and how we can change the system. When students don’t feel their educational experience makes them value themselves or feel a sense of achievement or feel confident in their abilities, we should question what changes and resources the medical school needs to offer to foster those feelings. Finally, when LGB medical students have worse quality of life than their heterosexual peers, we should consider how the medical school can change its practices and behaviors.

Second, each of these must be achieved with LGB students of color at the center. We must elevate the perspectives of LGB students of color to guide our action. We must engage students, faculty, staff, and administrators with systemic and institutional power to create changes that serve

LGB students of color, and not demand that LGB students, faculty, staff, and administrators of color bear the sole responsibility of creating an anti-racist, anti-heterosexist learning environment. We must create a learning environment that centers minoritized voices and adequately serves all of its students, not only those with power and privilege.

Lastly, though there are many students who have negative perceptions of learning environment and have worse quality of life, many students, LGB and heterosexual, white and of color, are doing well. We can identify qualities and practices that facilitate a positive learning experience and leverage them to build strengths in students who the learning environment is not serving.

My hope is that future studies in this area will not describe inequities for the sake of description. Instead, I hope that future studies will describe inequities towards the purpose of taking action on racism and heterosexism. My hope is that future studies need not describe inequities, understanding that systems of heterosexism, racism, heterosexist racism, and racist heterosexism persist regardless of the nuances of description and that description alone does little to address the material conditions of minoritized populations. May we focus our energy and research dollars on action to manifest liberation for Queer and Trans people of color.

Appendix A Study Outcomes Model Statistics

Table 13: Study outcome model statistics

	F	df	p	Adjusted R squared
LGB Alone				
Student-Faculty Interaction	105.62	5	p<0.001	0.016
Student-Student Interaction	123.29	5	p<0.001	0.018
Emotional Climate	158.75	5	p<0.001	0.023
Quality of Life	114.25	5	p<0.001	0.016
Race Alone				
Student-Faculty Interaction	64.04	11	p<0.001	0.021
Student-Student Interaction	99.42	11	p<0.001	0.032
Emotional Climate	65.23	11	p<0.001	0.021
Quality of Life	43.35	11	p<0.001	0.013
Race within Sexual Orientation				
Student-Faculty Interaction	88.56	11	p<0.001	0.030
Student-Student Interaction	89.09	11	p<0.001	0.031
Emotional Climate	71.21	11	p<0.001	0.025
Quality of Life	3.73	11	p<0.001	0.011

Appendix B Improvable Responses by Study Outcome

Appendix B.1 Student Faculty Interaction

Figure 1 disaggregates the student-faculty interaction subscale into its component questions and shows how responses vary among the sexual orientation and racial groups that differed statistically from their respective reference groups. Students could respond to each question with values of never, almost never, sometimes, fairly often, very often, or always. For “Faculty are reserved and distant with students” we considered a response improvable if students selected a value of sometimes or more. For all other questions, we considered a response improvable if students selected a value of sometimes or less. Only groups that differed significantly from their reference groups are displayed.

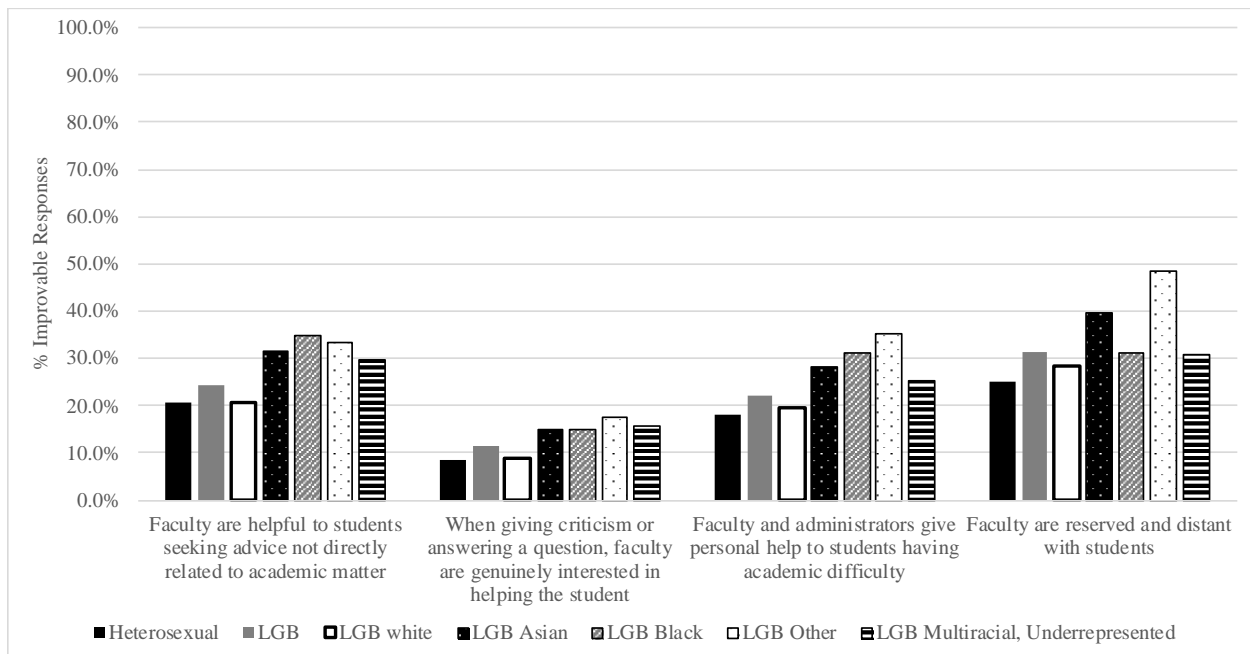


Figure 1: Percentage of students with improvable responses to questions for the Student-Faculty Interaction subscale

Appendix B.2 Student-Student Interaction

Figure 2 disaggregates the student-student interaction subscale into its component questions and shows how responses vary among the sexual orientation and racial groups that differed statistically from their respective reference groups. Students could respond to each question with values of never, almost never, sometimes, fairly often, very often, or always. For “Students in the school are distant with each other” we considered a response improvable if students selected a value of sometimes or more. For all other questions, we considered a response improvable if students selected a value of sometimes or less. Only groups that differed significantly from their reference groups are displayed.

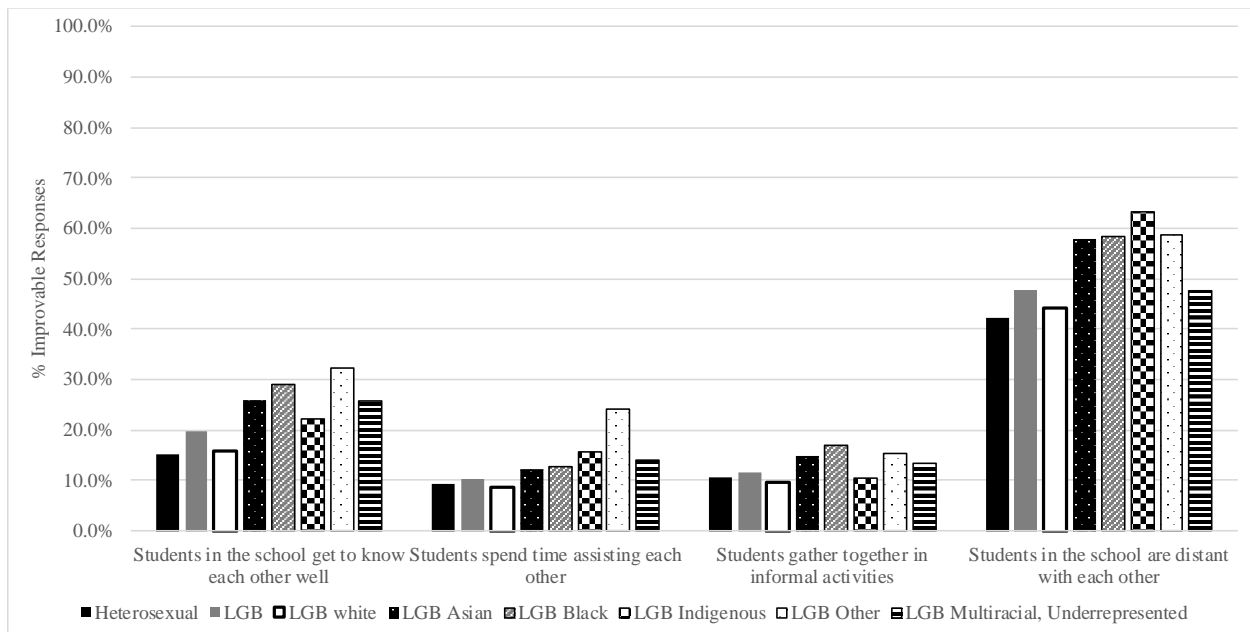


Figure 2: Percentage of students with improvable responses to questions for the Student-Student Interaction subscale

Appendix B.3 Emotional Climate

Figure 3 disaggregates the emotional climate subscale into its component questions and shows how responses vary among the sexual orientation and racial groups that differed statistically from their respective reference groups. Students could respond to each question with values of never, almost never, sometimes, fairly often, very often, or always. We considered a response improvable if students selected a value of sometimes or less. Only groups that differed significantly from their reference groups are displayed.

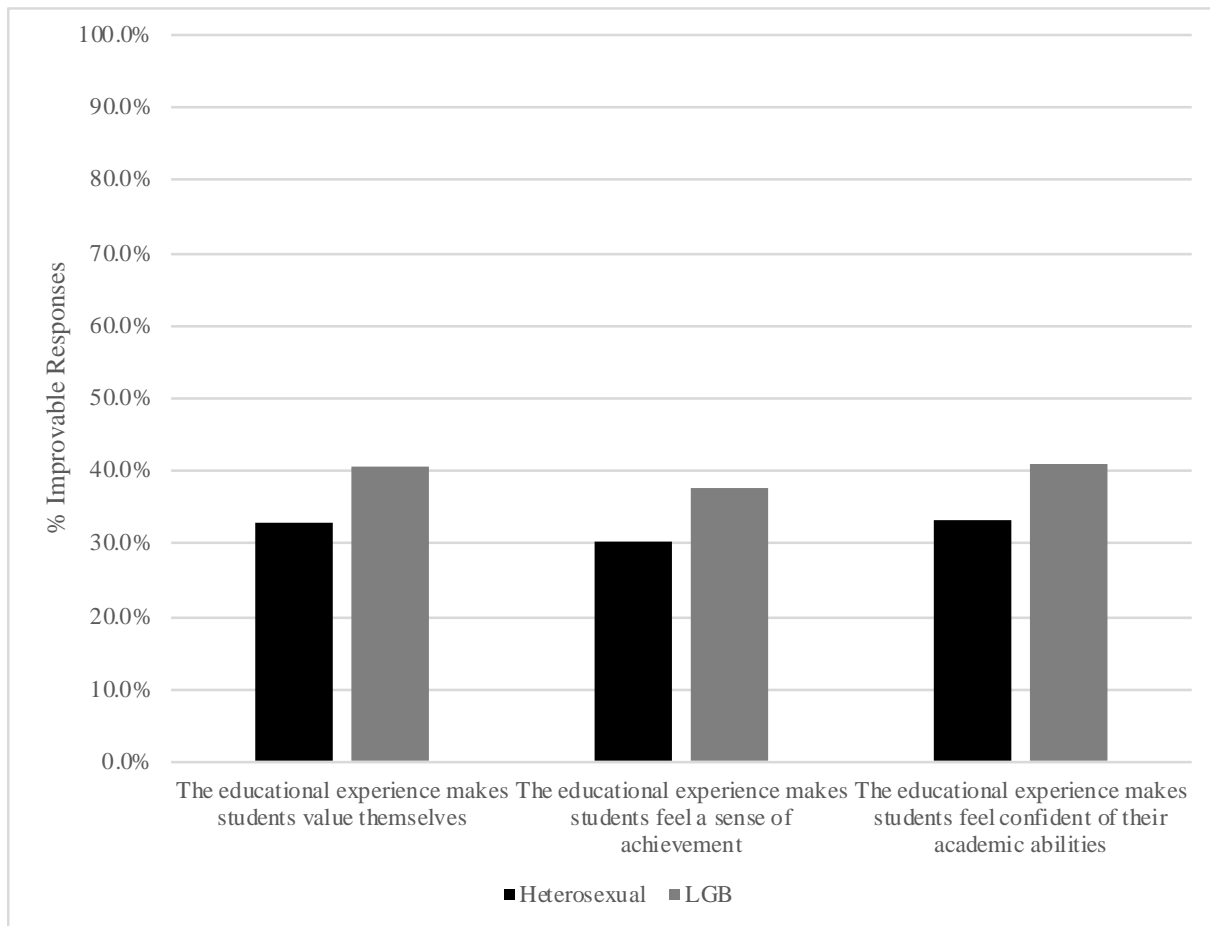


Figure 3: Percentage of students with improvable responses to questions for the Emotional Climate subscale

Appendix B.4 Quality of Life

Figure 4 disaggregates the quality of life scale into its component questions and shows how responses vary among the sexual orientation and racial groups that differed statistically from their respective reference groups. Students could respond to each question on a scale from 0-10, with 0 representing well-being as bad as it can be, and 10 as good as it can be. We considered a response improvable if students selected a value of 5 or less. Only groups that differed significantly from their reference groups are represented.

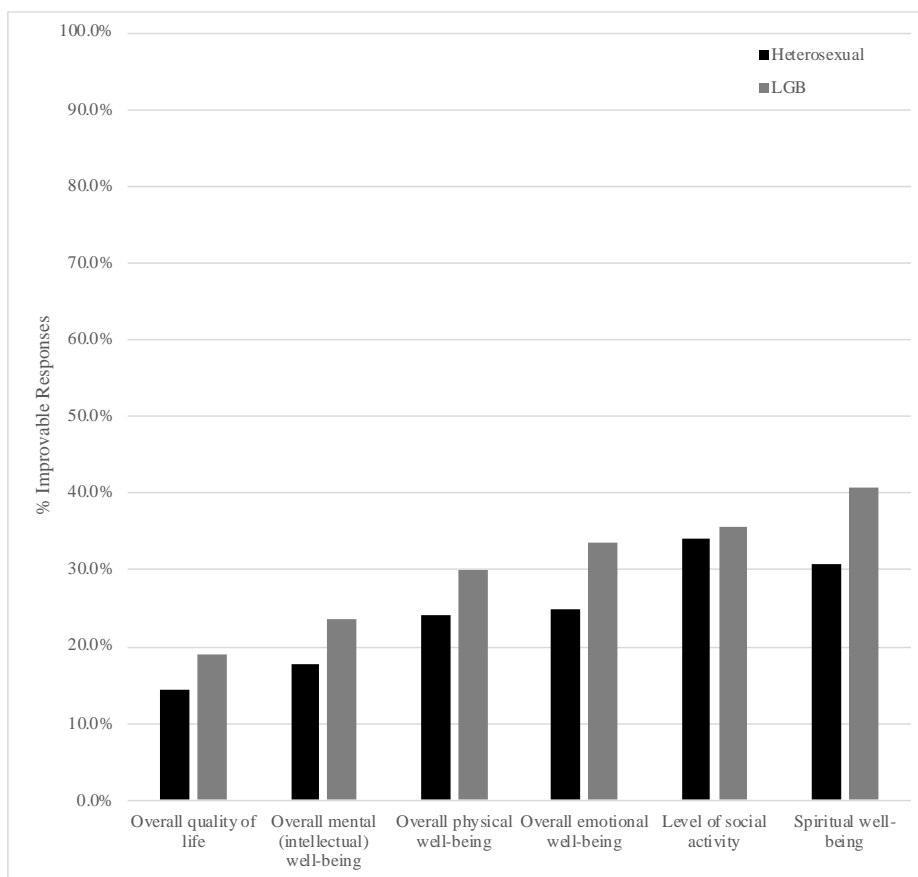


Figure 4: Percentage of students with improvable responses to questions for the Quality of Life Scale

Bibliography

1. Puthran R, Zhang MWB, Tam WW, Ho RC. Prevalence of depression amongst medical students: a meta-analysis. *Med Educ*. 2016;50(4):456-468. doi:10.1111/medu.12962
2. Mihailescu M, Neiterman E. A scoping review of the literature on the current mental health status of physicians and physicians-in-training in North America. *BMC Public Health*. 2019;19(1):1363. doi:10.1186/s12889-019-7661-9
3. Hu KS, Chibnall JT, Slavin SJ. Maladaptive Perfectionism, Impostorism, and Cognitive Distortions: Threats to the Mental Health of Pre-clinical Medical Students. *Acad Psychiatry*. 2019;43(4):381-385. doi:10.1007/s40596-019-01031-z
4. Przedworski JM, Dovidio JF, Hardeman RR, et al. A Comparison of the Mental Health and Well-Being of Sexual Minority and Heterosexual First-Year Medical Students: A Report From the Medical Student CHANGE Study. *Acad Med*. 2015;90(5):652-659. doi:10.1097/ACM.0000000000000658
5. Hardeman RR, Przedworski JM, Burke SE, et al. Mental Well-Being in First Year Medical Students: A Comparison by Race and Gender: A Report from the Medical Student CHANGE Study. *J Racial Ethn Health Disparities*. 2015;2(3):403-413. doi:10.1007/s40615-015-0087-x
6. Cabrera NL, Franklin JD, Watson JS. Whiteness in Higher Education: The Invisible Missing Link in Diversity and Racial Analyses: Whiteness in Higher Education. *ASHE Higher Education Report*. 2016;42(6):7-125. doi:10.1002/aehe.20116
7. Tempski P, Bellodi PL, Paro HBMS, Enns SC, Martins MA, Schraiber LB. What do medical students think about their quality of life? A qualitative study. *BMC Med Educ*. 2012;12:106. doi:10.1186/1472-6920-12-106
8. Enns SC, Perotta B, Paro HB, et al. Medical Students' Perception of Their Educational Environment and Quality of Life: Is There a Positive Association? *Acad Med*. 2016;91(3):409-417. doi:10.1097/ACM.0000000000000952
9. Helou MA, Keiser V, Feldman M, Santen S, Cyrus JW, Ryan MS. Student well-being and the learning environment. *Clin Teach*. 2019;16(4):362-366. doi:10.1111/tct.13070
10. Wasson LT, Cusmano A, Meli L, et al. Association Between Learning Environment Interventions and Medical Student Well-being: A Systematic Review. *JAMA*. 2016;316(21):2237-2252. doi:10.1001/jama.2016.17573
11. Mansh M, White W, Gee-Tong L, et al. Sexual and Gender Minority Identity Disclosure During Undergraduate Medical Education: "In the Closet" in Medical School. *Academic Medicine*. 2015;90(5):634-644. doi:10.1097/ACM.0000000000000657

12. Lapinski J, Sexton P. Still in the closet: the invisible minority in medical education. *BMC Med Educ.* 2014;14:171. doi:10.1186/1472-6920-14-171
13. Orom H, Semalulu T, Underwood W. The Social and Learning Environments Experienced by Underrepresented Minority Medical Students: A Narrative Review. *Academic Medicine.* 2013;88(11):1765-1777. doi:10.1097/ACM.0b013e3182a7a3af
14. Crenshaw K. Mapping the margins: intersectionality, identity politics, and violence against Women of Color. *Stanford Law Review.* 1991;43(6):1241. doi:10.2307/1229039
15. The Centers for Disease Control and Prevention (CDC). Well-being Concepts. Health-Related Quality of Life. <https://www.cdc.gov/hrqol/wellbeing.htm#three>
16. The World Health Organization (WHO). Constitution of the World Health Organization. Published online October 2006. https://www.who.int/governance/eb/who_constitution_en.pdf
17. National Institute of Mental Health. Major Depression. <https://www.nimh.nih.gov/health/statistics/major-depression.shtml>
18. Hardeman RR, Perry SP, Phelan SM, Przedworski JM, Burgess DJ, van Ryn M. Racial Identity and Mental Well-Being: The Experience of African American Medical Students, A Report from the Medical Student CHANGE Study. *J Racial Ethn Health Disparities.* 2016;3(2):250-258. doi:10.1007/s40615-015-0136-5
19. Dhaliwal JS, Crane LA, Valley MA, Lowenstein SR. Student perspectives on the diversity climate at a U.S. medical school: the need for a broader definition of diversity. *BMC Res Notes.* 2013;6:154. doi:10.1186/1756-0500-6-154
20. Broad J, Matheson M, Verrall F, et al. Discrimination, harassment and non-reporting in UK medical education. *Med Educ.* 2018;52(4):414-426. doi:10.1111/medu.13529
21. Nama N, MacPherson P, Sampson M, McMillan HJ. Medical students' perception of lesbian, gay, bisexual, and transgender (LGBT) discrimination in their learning environment and their self-reported comfort level for caring for LGBT patients: a survey study. *Med Educ Online.* 2017;22(1):1368850. doi:10.1080/10872981.2017.1368850
22. Sánchez NF, Rankin S, Callahan E, et al. LGBT trainee and health professional perspectives on academic careers--facilitators and challenges. *LGBT Health.* 2015;2(4):346-356. doi:10.1089/lgbt.2015.0024
23. Liaison Committee on Medical Education. *Functions and Structure of a Medical School: Standards for Accreditation of Medical Education Programs Leading to the MD Degree.* Liaison Committee on Medical Education; 2019:1-34.
24. Mujawar I, Sabatino M, Ray Mitchell S, Walker B, Weissinger P, Plankey M. A 12-year comparison of students' perspectives on diversity at a Jesuit Medical School. *Med Educ Online.* 2014;19:23401. doi:10.3402/meo.v19.23401

25. Phelan SM, Burke SE, Hardeman RR, et al. Medical school factors associated with changes in implicit and explicit bias against Gay and Lesbian people among 3492 graduating medical students. *J Gen Intern Med.* 2017;32(11):1193-1201. doi:10.1007/s11606-017-4127-6
26. Sánchez JP, Poll-Hunter N, Stern N, Garcia AN, Brewster C. Balancing Two Cultures: American Indian/Alaska Native Medical Students' Perceptions of Academic Medicine Careers. *J Community Health.* 2016;41(4):871-880. doi:10.1007/s10900-016-0166-x
27. Andrade JKL. Improving Health Equity Through Minority Psychiatry Trainees: One Journey to Becoming an Academic Psychiatrist of Indigenous Ancestry. *Acad Psychiatry.* 2017;41(3):427-429. doi:10.1007/s40596-016-0649-1
28. Sitkin NA, Pachankis JE. Specialty choice among Sexual and Gender Minorities in medicine: the role of specialty prestige, perceived Inclusion, and medical school climate. *LGBT Health.* 2016;3(6):451-460. doi:10.1089/lgbt.2016.0058
29. Wear D. Asian/Pacific Islander Women in Medical Education: Personal and Professional Challenges. *Teaching and Learning in Medicine.* 2000;12(3):156-163. doi:10.1207/S15328015TLM1203_7
30. Woolf K, Rich A, Viney R, Needleman S, Griffin A. Perceived causes of differential attainment in UK postgraduate medical training: a national qualitative study. *BMJ Open.* 2016;6(11):e013429. doi:10.1136/bmjopen-2016-013429
31. Forrest LL. Discovering Solidarity: An American Indian's First Day of Medical School. *Academic Medicine.* Published online February 2020:1. doi:10.1097/ACM.00000000000003237
32. Thomas B, Manusov EG, Wang A, Livingston H. Contributors of Black Men's Success in Admission to and Graduation From Medical School: *Academic Medicine.* 2011;86(7):892-900. doi:10.1097/ACM.0b013e31821d6f3d
33. Meyer IH. Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: conceptual issues and research evidence. *Psychol Bull.* 2003;129(5):674-697. doi:10.1037/0033-2909.129.5.674
34. The Association of American Medical Colleges (AAMC). Medical Education: Year 2 Questionnaire. Data & Reports. <https://www.aamc.org/data-reports/students-residents/report/year-two-questionnaire-y2q>
35. Association of American Medical Colleges. *Medical School Year Two Questionnaire: 2018 All Schools Summary Report.*; 2019:1-22.
36. Lett LA, Murdock HM, Orji WU, Aysola J, Sebro R. Trends in Racial/Ethnic Representation Among US Medical Students. *JAMA Netw Open.* 2019;2(9):e1910490. doi:10.1001/jamanetworkopen.2019.10490

37. Wolfe P. Settler colonialism and the elimination of the native. *Journal of Genocide Research*. 2006;8(4):387-409. doi:10.1080/14623520601056240
38. Jones R, Crowshoe L, Reid P, et al. Educating for Indigenous Health Equity: An International Consensus Statement. *Acad Med*. 2019;94(4):512-519. doi:10.1097/ACM.0000000000002476.
39. Diaz VM. Simply Chamorro: Telling Tales of Demise and Survival in Guam. *The Contemporary Pacific*. 1994;6(1):29-58.
40. Leibowitz AH. American Samoa: Decline of a Culture. *California Western International Law Journal*. 1980;10(2):220-271.
41. Marshall RE. Measuring the medical school learning environment. *J Med Educ*. 1978;53(2):98-104. doi:10.1097/00001888-197802000-00003
42. Rusticus S, Worthington A, Wilson D, Joughin K. The Medical School Learning Environment Survey: an examination of its factor structure and relationship to student performance and satisfaction. *Learning Environ Res*. 2014;17(3):423-435. doi:10.1007/s10984-014-9167-9
43. Damiano RF, Furtado AO, da Silva BN, et al. Measuring Students' Perceptions of the Medical School Learning Environment: Translation, Transcultural Adaptation, and Validation of 2 Instruments to the Brazilian Portuguese Language. *Journal of Medical Education and Curricular Development*. 2020;7:238212052090218. doi:10.1177/2382120520902186
44. Thomas MR, Dyrbye LN, Huntington JL, et al. How do distress and well-being relate to medical student empathy? A multicenter study. *J Gen Intern Med*. 2007;22(2):177-183. doi:10.1007/s11606-006-0039-6
45. Wong N, Menkes DB. Ethnic youth and sexual identity: the role of clinical and social support for 'double minorities.' *Australas Psychiatry*. 2018;26(2):181-183. doi:10.1177/1039856217748809
46. Blair KL, Pukall CF. Family matters, but sometimes chosen family matters more: Perceived social network influence in the dating decisions of same- and mixed-sex couples. *The Canadian Journal of Human Sexuality*. 2015;24(3):257-270. doi:10.3138/cjhs.243-A3
47. Pitcher EN, Camacho TP, Renn KA, Woodford MR. Affirming policies, programs, and supportive services: Using an organizational perspective to understand LGBTQ+ college student success. *Journal of Diversity in Higher Education*. 2018;11(2):117-132. doi:10.1037/dhe0000048
48. Hatzenbuehler ML. How does sexual minority stigma "get under the skin"? A psychological mediation framework. *Psychological Bulletin*. 2009;135(5):707-730. doi:10.1037/a0016441
49. King M, Semlyen J, Tai SS, et al. A systematic review of mental disorder, suicide, and deliberate self harm in lesbian, gay and bisexual people. *BMC Psychiatry*. 2008;8(1):70. doi:10.1186/1471-244X-8-70

50. Parent MC, DeBlaere C, Moradi B. Approaches to Research on Intersectionality: Perspectives on Gender, LGBT, and Racial/Ethnic Identities. *Sex Roles*. 2013;68(11-12):639-645. doi:10.1007/s11199-013-0283-2
51. Iwamoto DK, Liu WM. The impact of racial identity, ethnic identity, Asian values, and race-related stress on Asian Americans and Asian international college students' psychological well-being. *Journal of Counseling Psychology*. 2010;57(1):79-91. doi:10.1037/a0017393
52. Hui K, Lent RW, Miller MJ. Social Cognitive and Cultural Orientation Predictors of Well-Being in Asian American College Students. *Journal of Career Assessment*. 2013;21(4):587-598. doi:10.1177/1069072712475289
53. Mun RU, Hertzog NB. The Influence of Parental and Self-Expectations on Asian American Women Who Entered College Early. *Gifted Child Quarterly*. 2019;63(2):120-140. doi:10.1177/0016986218823559
54. Samura M. Remaking Selves, Repositioning Selves, or Remaking Space: An Examination of Asian American College Students' Processes of "Belonging." *Journal of College Student Development*. 2016;57(2):135-150. doi:10.1353/csd.2016.0016
55. Brunsma DL, Rockquemore KA. What Does "Black" Mean? Exploring the Epistemological Stranglehold of Racial Categorization. *Critical Sociology*. 2002;28(1-2):101-121. doi:10.1177/08969205020280010801
56. Kulaylat AN, Qin D, Sun SX, et al. Perceptions of mistreatment among trainees vary at different stages of clinical training. *BMC Med Educ*. 2017;17(1):14. doi:10.1186/s12909-016-0853-4